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E91 Sports Wagon

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E91 Sports Wagon

Model: E91

Production: All

OBJECTIVES

After completion of this module you will be able to:

- Familiarize yourself with the changes to the E91
- Understand the Electro-Dynamic Planar Loudspeaker

Introduction

The new 3 Series Sports Wagon satisfies the standards of style, flexibility and performance - far in excess of sheer driving pleasure. It combines first class driving dynamics with versatile functionality.

It will be introduced in the US as a 325xiT in September 2005. Variants will be available in March 2006.

The technical basis of the E91 is the E90, the 3 Series Sedan, with which the Sports wagon is virtually identical up to the B-pillar. Therefore, what has already been said about the 3 Series Sedan also applies to the Sports Wagon: It is - when compared with the previous model (E46) - stronger and bigger, and the E91 has above all become more functional.

Like the Sedan, the E91 has sporty proportions thanks to its long engine bonnet and a striking swage line rising along the entire side of the car as an expression of powerful dynamics.

The roof line of the Sports Wagon is like a Coupé and the roof spoiler is integrated in these lines. Roof rails are standard.



Technical highlights of the new 3 Series Sports Wagon are its two-part rear hatch and a large panorama sunroof available as an option.

The rear hatch is set at a much lower level in the interests of a low loading sill. The rear tailgate continues to be composed of two segments (the rear window can be opened separately).



At first glance, the panorama sunroof of the E91 is identical to similar roofs from X-vehicles and the 5 Series Sports Wagon. However, it does differ from it in some details.

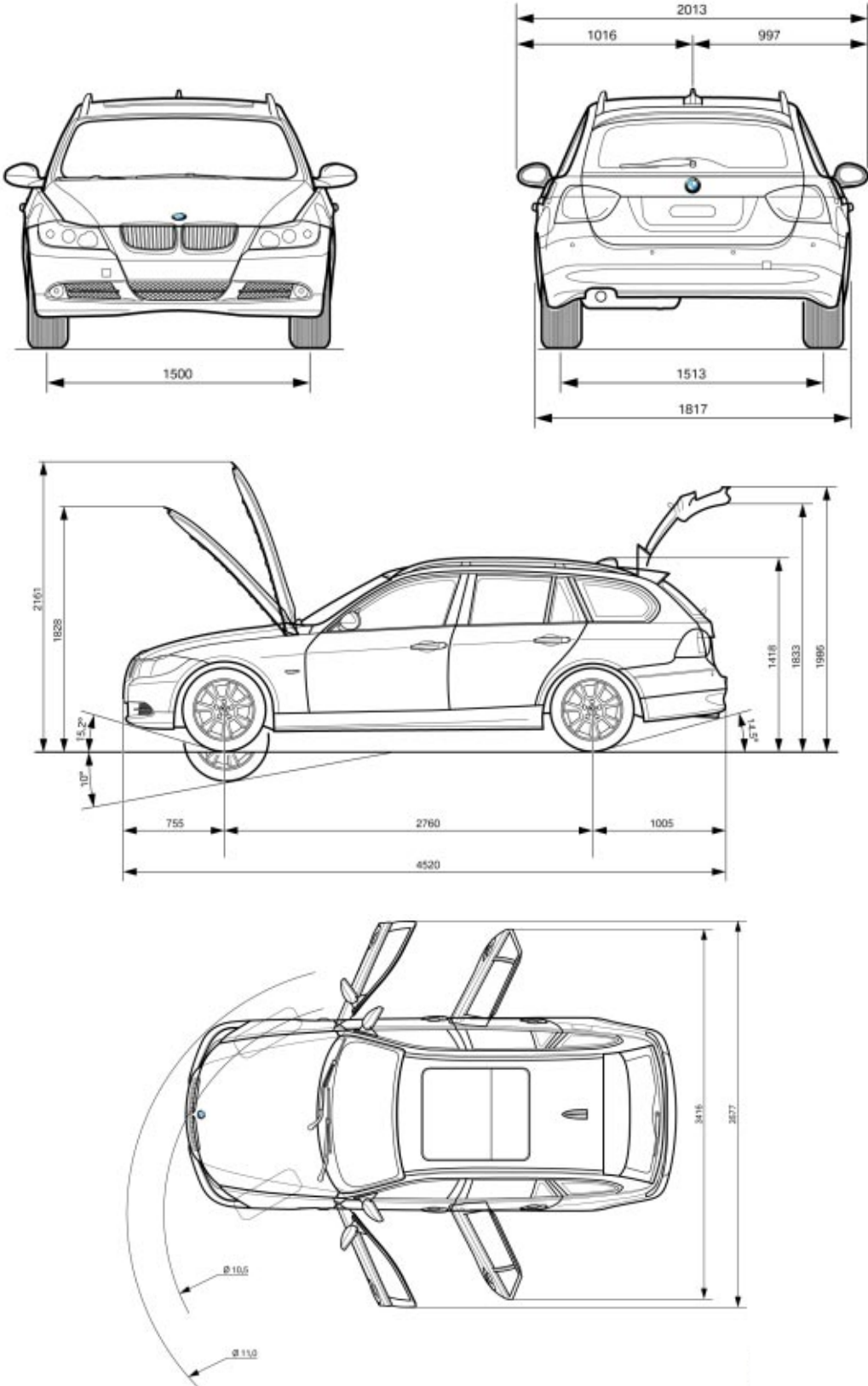


This Manual describes the E91 with regard to all points on which it differs from the E90. Points on which the Sports Wagon is identical to the sedan are not repeated here.

Technical Data

	E46 325xi Touring	E91 325xi Touring
Length (in)	176.3	178.2
Width (in)	68.5	71.5
Height (in)	56.3	55.8
Wheelbase (in)	107.3	108.7
Track, front (in)	57.9	59.1
Track, rear (in)	58.4	59.6
Unladen weight (lbs)	3594 (3627 auto)	3737 (3781 auto)
Displacement (ccm)	2498	2996
Cargo capacity (ft ³)	57 (seats down)	TBD
Engine Type (cyl / type)	6 / in-line	6 / in-line
Nominal output (hp)	184 @ 6000 rpm	215 @ 6250 rpm
Max. torque (lb-ft)	175 @ 3500 rpm	185 @ 2750 rpm
Drag Coefficient (Cd)	.32	.31
Top Speed (mph)	128	130
Acceleration (6-60 mph)	7.8 (9.0)	TBD
Compression Ratio	10.5:1	10.7:1
Weight Distribution (manual)	50.1 / 49.9	50.4 / 49.6
Weight Distribution (auto)	50 / 50	50.7 / 49.3

Vehicle Data Views



Body

Like the Sedan, the body of the new BMW 3 Series Sports Wagon is conventionally manufactured from steel. It is fully galvanized and equipped with a safety passenger cell. All the performance data of the E90 with regard to weight optimization, body stiffness and supreme safety levels apply without any compromises to the E91 as well.

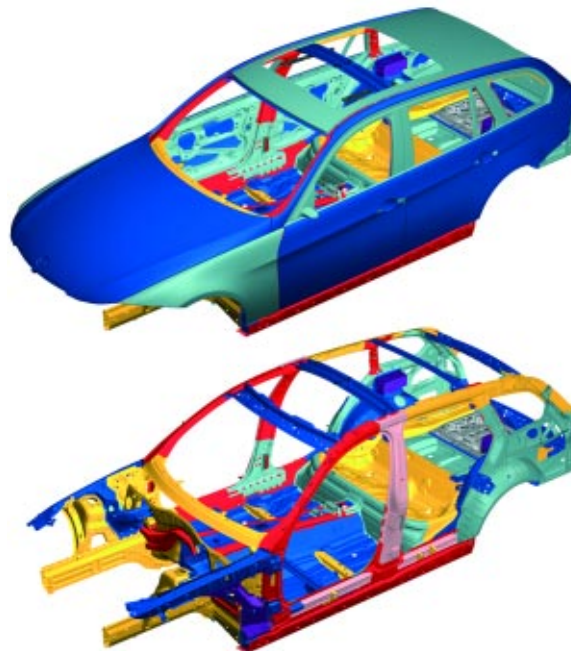
The bodies of the Sedan and Sports Wagon were developed in parallel. This has made it possible from the start not only to identify the identical components required but also to take into account parts and components specific to the Sports Wagon.

The specific stiffness configuration of the E91 is based on very high target values, where the lightweight side-frame concept already takes into account the special demands made by the large roof opening for the panorama sunroof.

Unlike in previous 3 Series Sports Wagons, the floor assembly does not require any Sports Wagon-specific reinforcements because the lightweight concept of the E91 has already been geared towards the increased demands placed on the Sports Wagon. Because of this, the new 3 Series Sports Wagon copes perfectly well without additional reinforcements which would increase the car's weight and limit interior space and load space.

The body of the new 3 Series Sports Wagon also fulfills all the requirements from a functional standpoint. When compared with its predecessors, it is characterized by a even larger luggage-compartment volume of 16.24 cu. ft. (460 liters) and 49 cu. ft. (1385 liters) with the backrests folded down. The indentation in the rear bumper reduces the height of the loading sill and makes loading easier.

The static stiffness is approx. 19000 Nm/degree, while the dynamic stiffness is approximately 29 Hz.



Panorama Sunroof

All E91 Sports Wagons sold in the US will be equipped with a panorama sunroof. The E91 panorama sunroof is an internally operating slide/tilt sunroof with two glass lids and two floating roofliners.

The glass surface area of the E91 sunroof has increased by 140% when compared with the sunroof on the E46 Sports Wagon. This improves the sense of space felt by both the front and the rear passengers.



Panorama Sunroof (E91)



Single Panel Sunroof (E46/3)

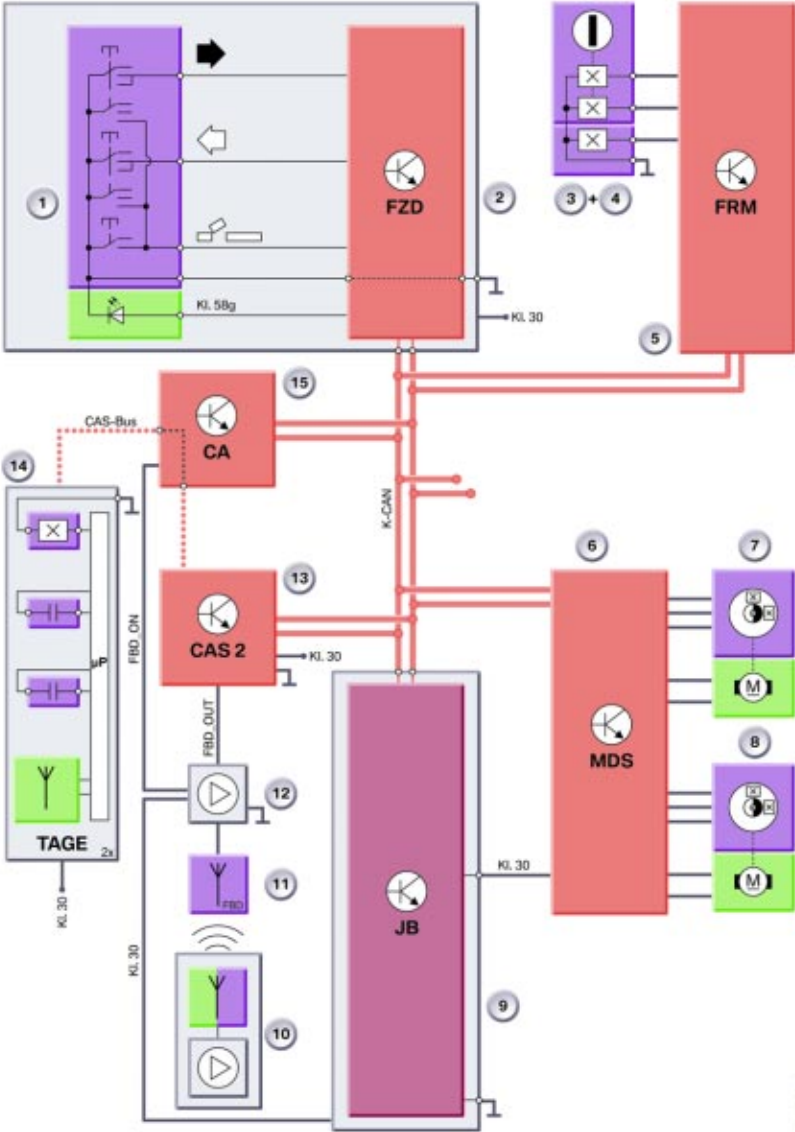
The E91 panorama sunroof is based on that of the E83 with a slight yet significant change. The 50 mm wide ventilation gap on the floating roofliners is at the front and not in the middle as on the E83.

The wind deflector is operated by a mechanism controlled via the floating roofliner motor. This wind deflector is controlled as a function of vehicle speed.

In this way, both lower-frequency drumming (at approx. 70 km/h) and higher-frequency whistling (above 120 km/h) are suppressed.

This is achieved by the net wind deflector, which adopts different heights and therefore counteracts the interference noise.

Panorama Sunroof System Overview



Index	Explanation	Index	Explanation
1	Button for Panorama Glass Sunroof	9	Junction Box Electronics (JBE)
2	Roof Function Center (FZD)	10	Identification Transmitter
3	Lock Cylinder, Driver's Door	11	Rear Window Antenna
4	Door Contact, Driver's Door	12	Remote Control Receiver
5	Footwell Module (FRM)	13	Car Access System 2
6	Multi Drive Sunroof Control Unit (MDS)	14	Electronic Outer Door Handle (TAGE)
7	Motor Panorama Sunroof (glass)	15	Comfort Access
8	Motor Panorama Sunroof (liner/deflector)		

System Components

The panorama sunroof is composed of the following components:

- Glass panels
- Roofliners
- Wind Deflector
- 1 glass panel motor
- 1 headliner/wind deflector motor
- Multi Drive Sunroof (MDS) control unit
- Roof Function Center (FZD) control unit
- Footwell Module (FRM)
- Junction Box (JB)
- Car Access System 2 (CAS2)
- Dynamic Stability Control Unit (DSC)



Individual Components of Panorama Sunroof

■ Glass Panels / Roofliners

Both glass lids can be removed from the E91 panorama sunroof. The retaining screws must also be released if the lids are adjusted.

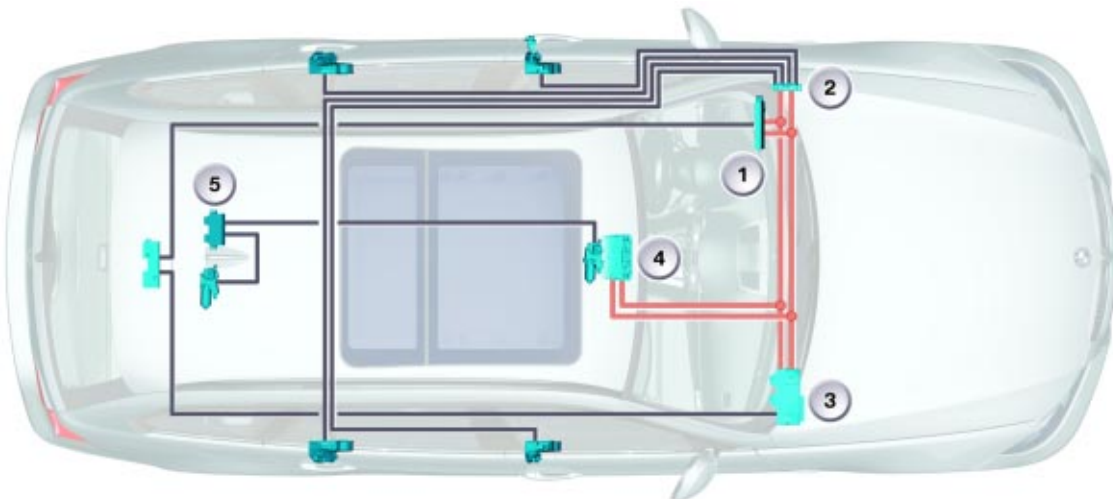
The two floating roofliners can then also be removed. When the panorama sunroof casing is installed, the two electric motors and the wind deflector can still be installed and removed.

■ Motors

The panorama sunroof uses two motors for operation. One motor is used solely for the operation of the glass panels and the other controls the roofliners and wind deflector.

The motors are identical and thus can be interchanged for diagnostic purposes but should always be left in their original position. This is due to the wear pattern on the motor drive to the bowden/screw cable that drives the sunroof components.

Each motor contains two Hall sensors offset by 90 degrees with respect to each other. This enables the MDS control unit to accurately detect rotation, speed of rotation, and direction of rotation. This signal is also used to detect a possible trapping condition.



Electrical Components of Panorama Sunroof

Index	Explanation
1	Car Access System (CAS2)
2	Footwell Module (FRM)
3	Junction Box Electronics (JBE)
4	Roof Function Center (FZD)
5	Multi Drive Sunroof (MDS)

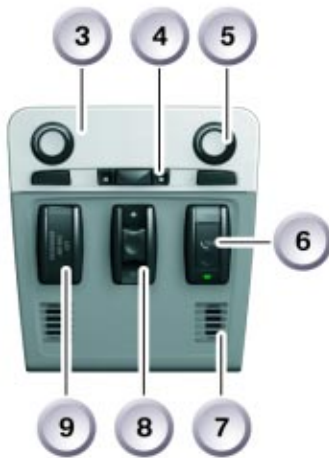
■ Multi Drive Sunroof (MDS) Control Unit

A separate control unit is installed for the panorama glass sunroof functions. The panorama glass sunroof control unit (multi drive sunroof MDS) controls and monitors the electric motors and thus the movement of the panorama glass sunroof.

The MDS is installed in the headliner behind the panorama glass sunroof. It can be accessed from the rear of the vehicle.

■ Roof Function Center (FZD) control unit

The FZD is used to receive the sunroof switch status and convert it to a signal that can be transmitted to the MDS control unit over the K-CAN. The roof function center control unit also houses the sunroof switch.



Index	Explanation
1	Interior lighting under transparent trim
2	Ambient lighting
3	Reading light
4	Ambient lighting
5	Reading light
6	Emergency call
7	Handsfree microphone

Roof Function Center Control Unit (FZD)

■ Footwell Module (FRM)

The FRM transmits the status of the driver's lock cylinder for convenience open/close features.

■ Junction Box

The JB supplies the MDS control unit power via a KL30g circuit for panorama sunroof motor operation.

■ Car Access System 2

The CAS2 enables or disables the operation of the panorama sunroof by sending terminal status signals to the MDS control unit via the K-CAN.

■ Dynamic Stability Control Unit

The DSC control unit is responsible for making the vehicle speed signal available to the MDS control unit for wind deflector operation.

Principles of Operation

The panorama sunroof operation has been almost entirely adapted from the E61 Sports Wagon and X3/X5.

The only difference in operation is that when the sunroof glass panels are placed in the vent mode, the floating headliner does not vent from the middle. Instead the sunroof headliner slides back from the front section similar to conventional single panel sunroofs.



Ventilation Gap E91

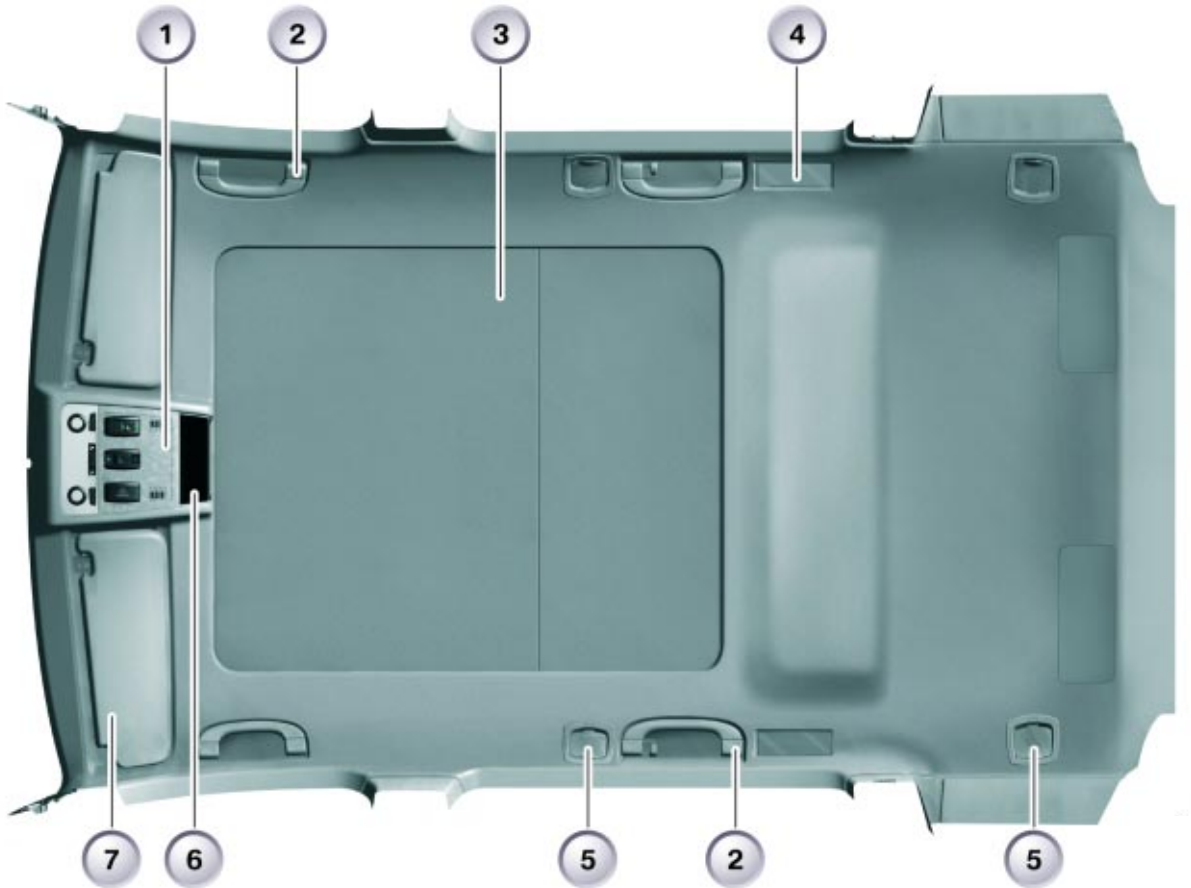


Ventilation Gap E61

Notes

Headliner

The headliner of the E91 is totally new due to the changes in the body and the panorama sunroof.



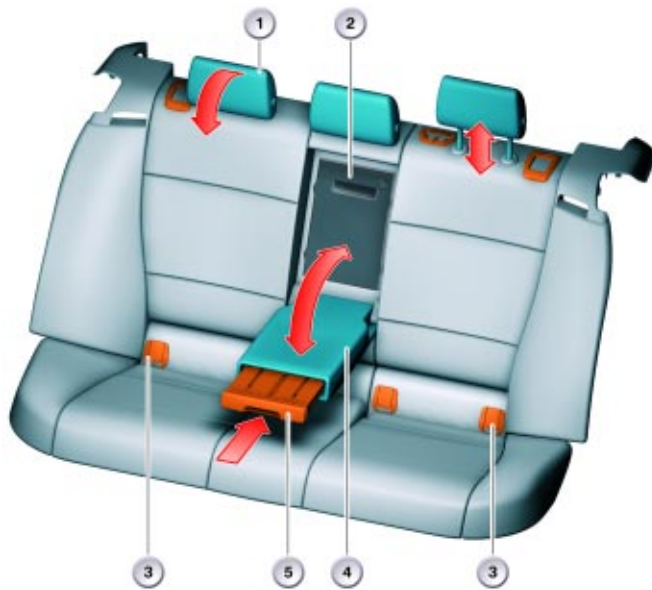
Index	Explanation
1	Roof Function Center (FZD)
2	Roof Handles, (Rear with Coat Hooks)
3	Panorama Sunroof
4	Interior Lights
5	Attachment Mount (Eyelet) for Combination Roller Blind
6	Ultrasonic Interior Movement Detector
7	Sun Visor with Illuminated Vanity Mirror

Rear Seats

The rear of the E91 Sports Wagon is equipped with 60/40 fold down rear seats. This allows for increased cargo capacity as well as a varied storage configurations.

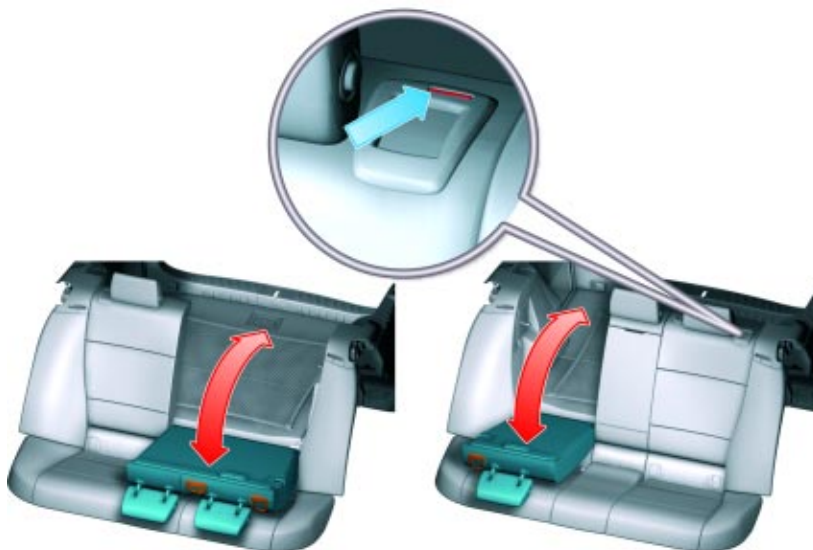
The belt-buckle tensoning system, ISOFIX (child seat holder), and center armrest are fitted as standard equipment. A removable skibag module is optionally available.

A new feature are the manually folding head restraints. This allows a clearer view of the rear when the rear seats are not occupied.



Index	Explanation
1	Folding Head Restraints
2	Skibag
3	ISOFIX covers
4	Armrest
5	Cup Holder

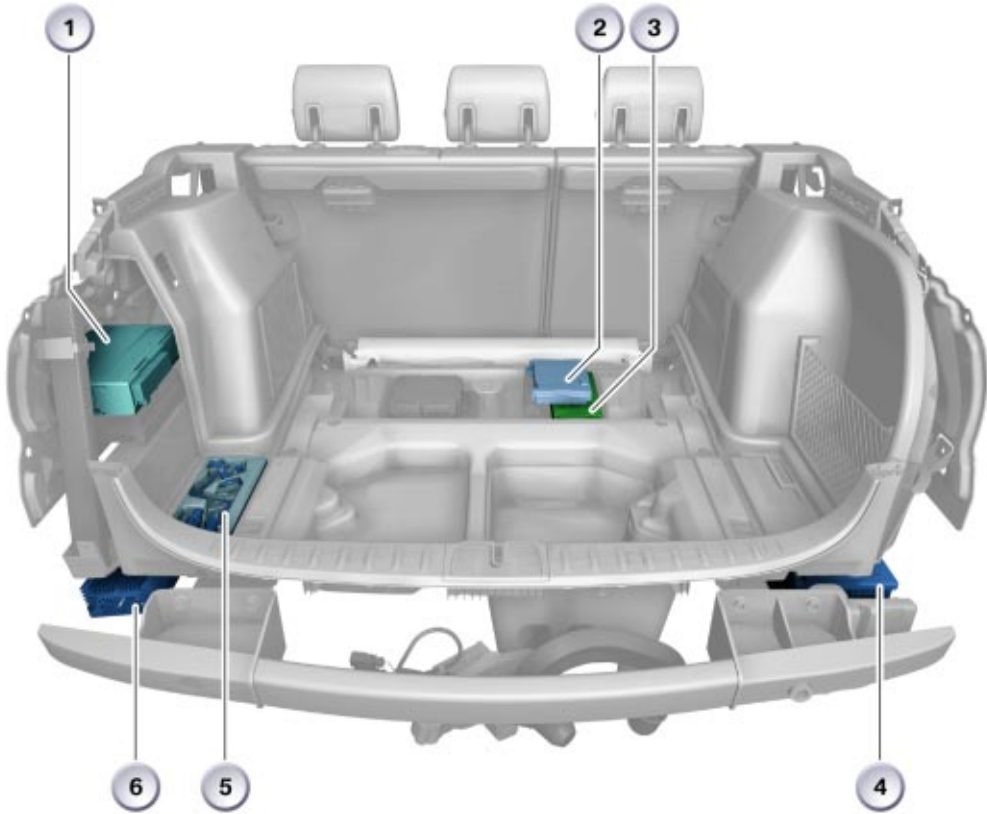
A red warning pin emerges when the backrest is released. By folding down the backrests, it is possible to increase the cargo capacity from 16.25 cu. ft. to 48.9 cu. ft. That is an increase of 1 cu. ft. over the E46 Sports Wagon.



Folding Backrests with Release Mechanism

Luggage Compartment

The luggage compartment has been developed to maximize storage capacity as well as offer a varied storage configuration.



Index	Explanation
1	CD Changer
2	SDARS (SIRIUS) Control Unit
3	Telematics Control Unit (TCU)
4	Battery
5	Vehicle Tools
4	Top HiFi (Logic7) Amplifier

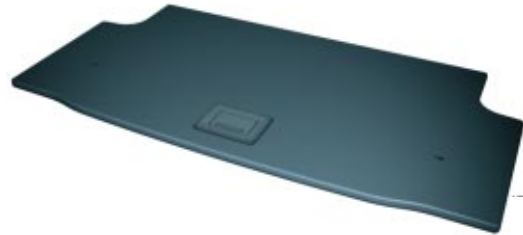
■ Storage Pan

A storage pan is located under the turning floor. The material is composed of easily washable fleece. This storage area with its removable, variable segmentation serves to store small parts which are not in the immediate field of vision.



■ Turning Floor

The back of the turning floor is coated with an anti-skid nobbled finish and can be wiped clean. It serves to transport dirty objects. The surface can be quickly replaced by turning the floor over.



■ Trim Panels

The customer can tidily store assorted small items such as gloves, ice scrapers, bottles, cloths, etc. The parts are securely stored and the luggage compartment remains uncluttered and tidy.

The luggage compartment storage pack offers:

- Left and right side lashing straps on the luggage compartment trim panels
- Left and right swing-out bag holders
- 12-volt power socket (left side trim panel)
- Umbrella holder under the roller blind cover
- Rear right side stowage net (slides down to accommodate long items ex. golf clubs)



Left panel with 12 Volt socket



Right Panel



Right Storage Net

Combination Roller Blind

The roller blind incorporates the following features:

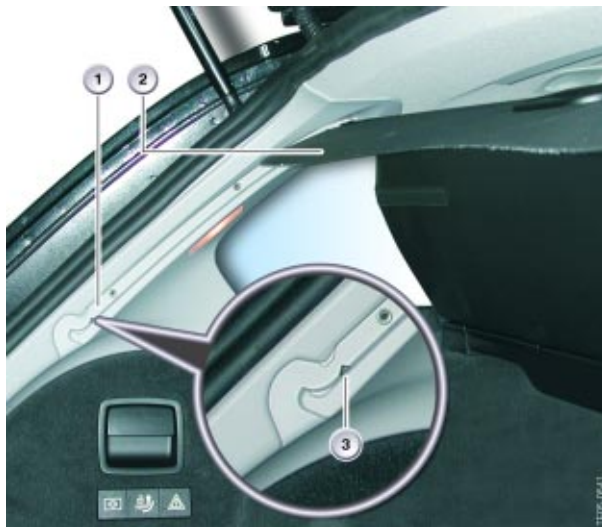
- Roller blind cover with comfort opening
- Dividing net function for loads backrests up and down
- Umbrella holder

■ Roller Blind Cover with Comfort Opening

The cargo cover on the E91 utilizes the same concept as the E61 Sports Wagon. It has the automatically retracting feature when opening either the tailgate or the glass window of the tailgate. To activate the retractable cover, press the outer rear hatch button a second time within 3 seconds when opening or press the window release button once.

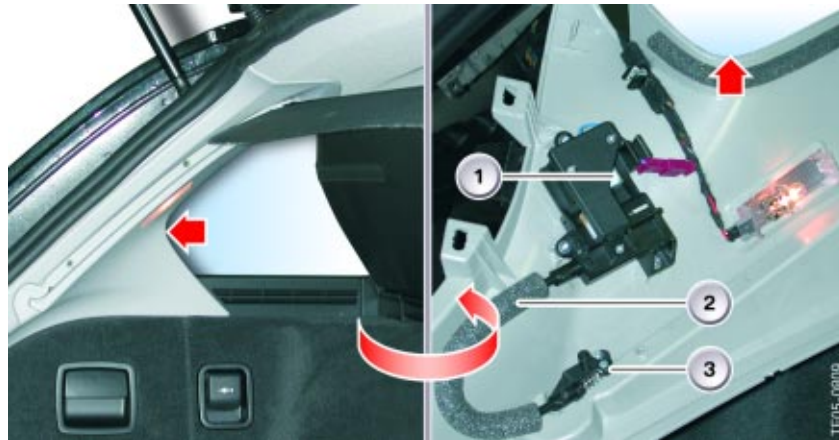


Index	Explanation
1	Release Drive Mechanism, Left
2	Release Drive Mechanism, Right



Index	Explanation
1	Guide Rail, Left
2	Combination Roller Blind
3	Release Mechanism

Release Mechanism for the Rear Glass



Index	Explanation
1	Voltage regulator
2	Ignition output stage for belt force limiter
3	Igniter pellet for belt force limiter

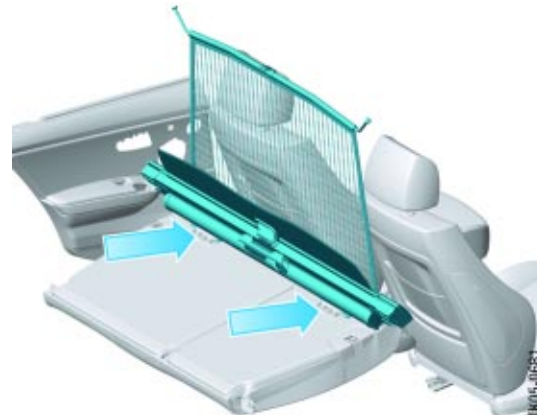
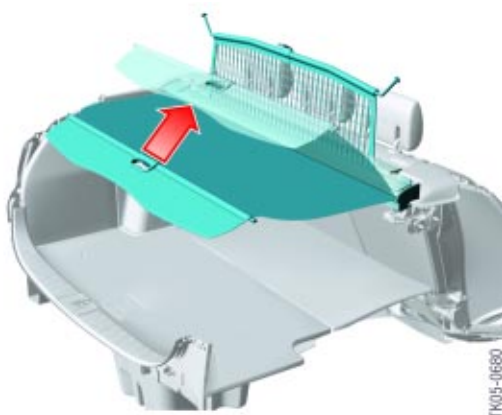
The junction box control unit then activates the release drives of the combination roller blind for approx. 2 secs. The rotary motion of the release drives releases the combination roller blind via Bowden cables.

When the fixture for the roller blind cover is automatically released, the retaining rod slides with the roller blind cover upwards in the left and right guide rails to provide access to the boot space. This allows the customer to load through the rear window opening without having to additionally open the entire tailgate. The cover does not lower itself automatically. It has to be lowered manually.

■ Dividing Net Function for Loads

The combination roller blind offers a load securing function when the backrests are folded down as well as in their upright position.

The customer can secure the load to prevent damage in the event of a sudden deceleration by pulling out a dividing net and engaging the rods in the designated eyelets.



■ **Umbrella Holder**

It is possible to stow an umbrella under the combination roller blind by means of a spring loaded fixture.



Umbrella Holder

Rear Hatch

The rear hatch is designed so that the rear window can be opened separately. It is thus possible, for example when loading and unloading lighter objects, to reach the luggage compartment without having to open the complete rear hatch. This facilitates swift loading and unloading operations.



Tailgate and Window Open



Window Open

Unlocking the Rear Hatch/Window

The tailgate can be open by:

- Remote control/identification transmitter
- Rear hatch button inside the vehicle on the A-pillar
- Rear window button in the rear hatch
- Pulling the emergency release cable on the rear tailgate

■ Opening the Rear Hatch

The boot lid can be unlocked via the remote control, the identification transmitter, the outer or inner boot lid release button.

■ Opening with Remote Control / Identification Transmitter

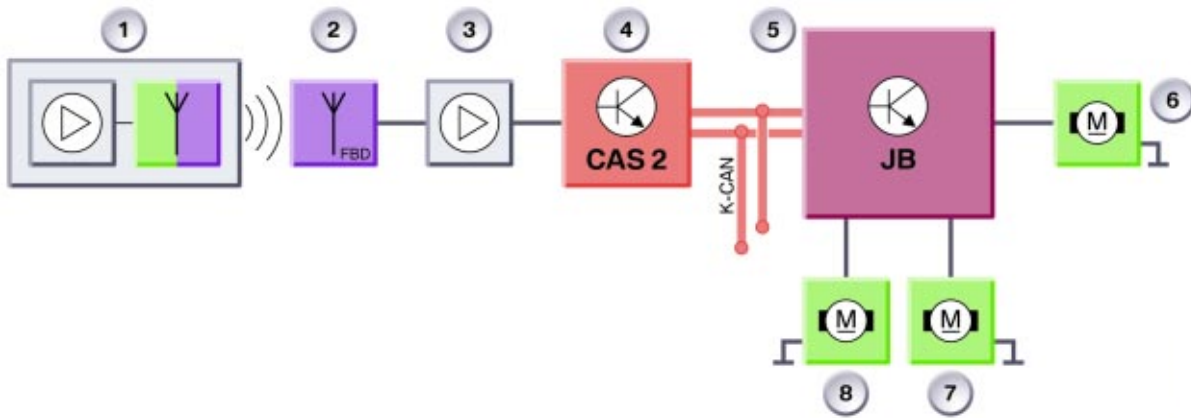
When the release button with the rear hatch symbol remote control/identification transmitter is pressed, the signal reaches first the rear window antenna and then the remote control receiver.

The remote control receiver is located in the diversity module and forwards the signal to the car access system 2. The signal of the identification transmitter is verified in the car access system 2. If the signal is recognized as valid, the junction box control unit is enabled for the purpose of unlocking the central locking drive units.

The junction box control unit now activates the central locking drive unit for the rear hatch. The rear hatch opens irrespective of whether the vehicle is locked or not.

The motor in the lock of the rear hatch is activated via a power output stage in the junction box control unit. The rear hatch is opened.

The unlocking procedure for the rear hatch is illustrated in the following based on the example of unlocking with the identification transmitter.



Index	Explanation	Index	Explanation
1	Identification Transmitter	5	Junction Box Electronics
2	Rear Window Antenna	6	Electric Motor, Rear Hatch
3	Remote Control Receiver in Diversity Module	7	Electric Motor, Rear Window
4	CAS2	8	Release Motors for Roller Blind (x2)

■ Opening with the Outer Rear Hatch Button

As soon as the vehicle is unlocked, the rear hatch can be opened by pressing the outer rear hatch button.

The microswitch switches to ground when the outer rear hatch button is pressed.

The junction box control unit monitors the microswitch. The rear hatch is unlocked and opened when the signal from the microswitch goes to low.

■ Opening with the Emergency Release Cable

In case of electrical failure or someone being trapped in the cargo area, there is a mechanical tailgate release mechanism on the rear tailgate.



Index	Explanation
1	Pull Handle
2	Bowden Cable
3	Tailgate Latch Mechanism

■ Junction Box Control Unit

The central locking for the rear hatch and the rear window is activated directly via a power output stage. The junction box control unit monitors the status of both the outer rear hatch button and the rear window button.

When one of the buttons is pressed, the junction box control unit activates the central locking drive unit.

The car access system 2 monitors the status of the inner rear hatch button. The status is communicated to the junction box control unit via the K-CAN. When requested to unlock the rear hatch, the junction box control unit activates the central locking drive unit.

Note: To release the roller blind when opening the rear tailgate assembly press the tailgate release button a second time within 3 seconds.

Drivetrain

Engines

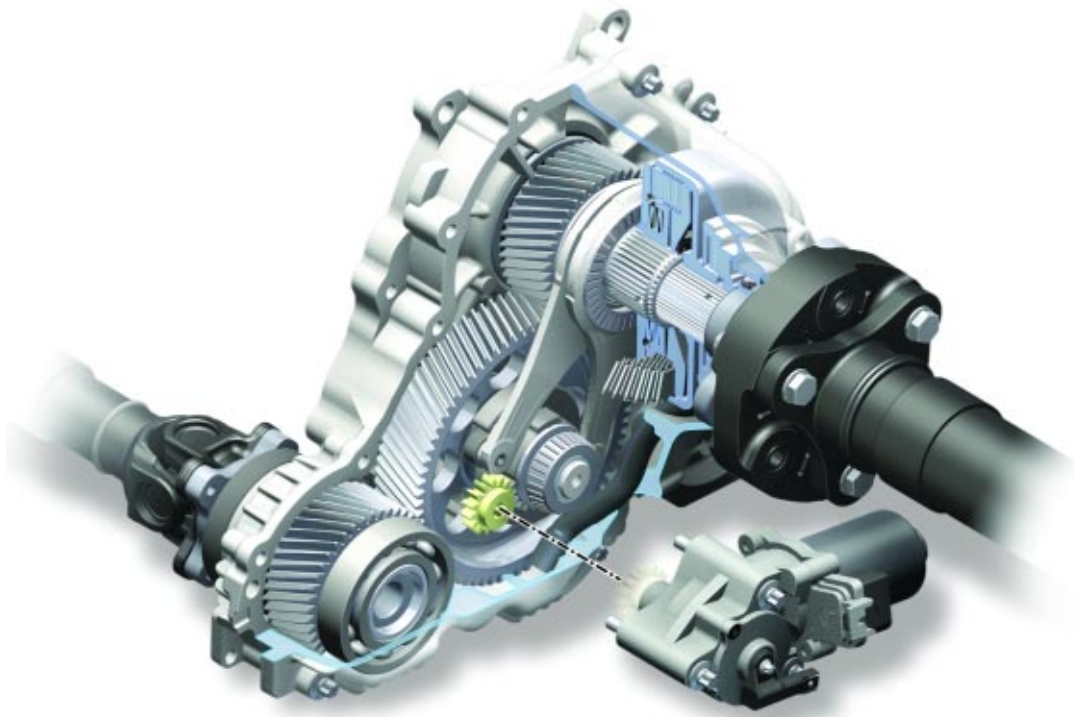
Initially the E91 Sports Wagon will only be offered as a 325xiT with later configurations to follow.

The new BMW N52-generation inline six cylinder engines deliver incomparable agility with more power but less weight and lower fuel consumption. VALVETRONIC and double VANOS are additional features of this engine which, in the E91 as already in the E90, is combined exclusively with 6-speed gearboxes.

xDrive All-Wheel-Drive System

Initially the E91 Sports Wagon will only be offered in an all wheel drive version. At the same time, the all-wheel-drive system will also be making its debut in the new 3 Series Sedan (September 2005).

The system and function are already familiar from the X3, X5 and 5 Series. Some components such as e.g. the propeller shafts have been geometrically adapted to the altered space conditions in the 3 Series.

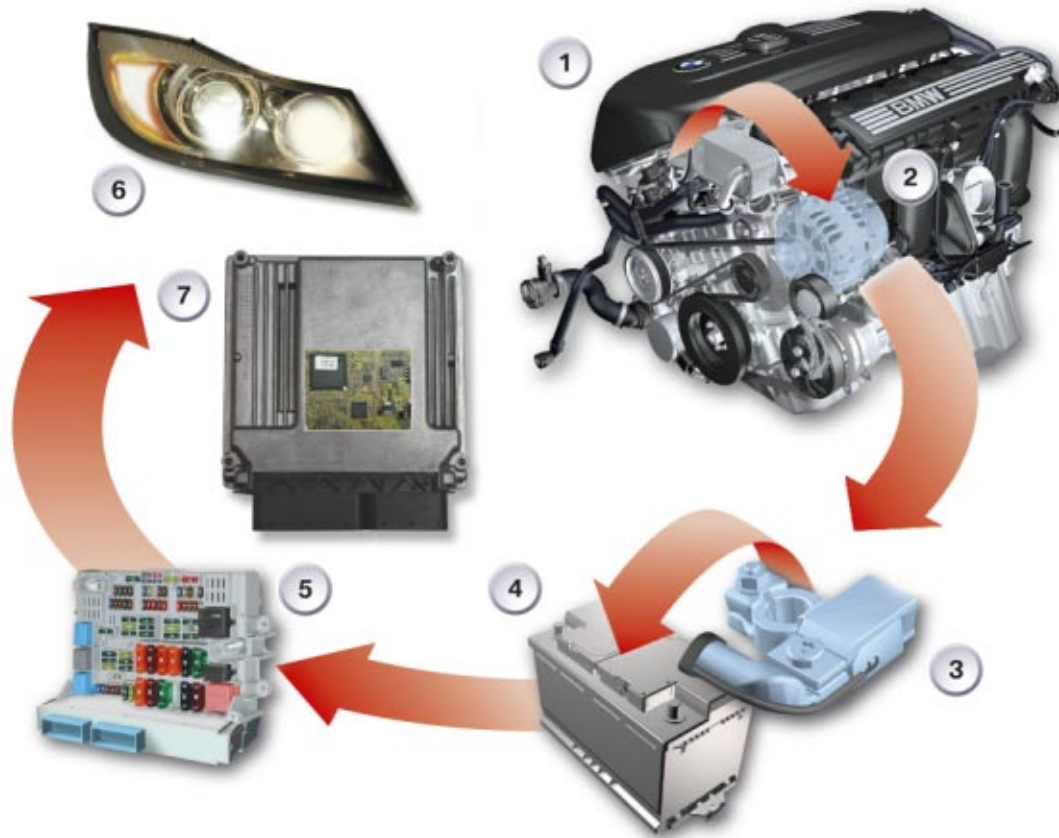


xDrive System Components

Note: For detailed information on the xDrive system refer to the Chassis Dynamics (ST056) training manual in TIS.

Energy Management

The energy management of the E91 is adopted from the E90. The engine control module incorporates the software needed for functionality.



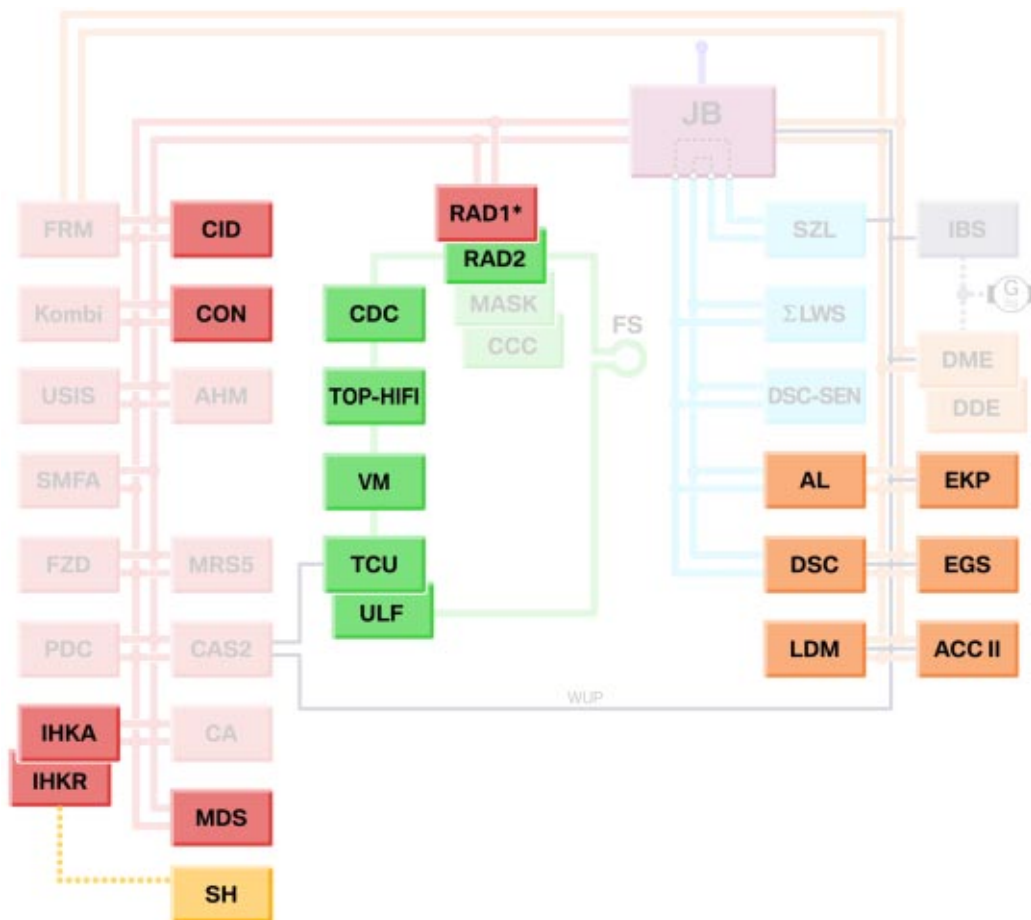
Index	Explanation	Index	Explanation
1	Engine	5	Junction Box
2	Generator	6	Electrical Load (example: headlights)
3	Intelligent Battery Sensor	7	Engine Control Unit with Integrated Energy Management
4	Battery		

Terminal 30g Relay - (time-dependent deactivation)

The terminal 30g relay deactivates the connected electrical loads/consumers after 30 minutes. If the vehicle is equipped with a telephone or independent heating, the run-on time is extended to 60 minutes. The terminal 30g relay is activated by the car access system 2.

The terminal 30g concept will be extended from 09/05, therefore the following electrical loads/consumers will be added to the terminal 30g relay connection.

- Panorama glass sunroof MDS
- Seat heating
- Active front steering AL
- Longitudinal dynamics management LDM
- Electric fuel pump control unit EKP
- Electronic transmission control EGS
- Active cruise control 2 ACC 2.



Control Units on the KL30g Circuit

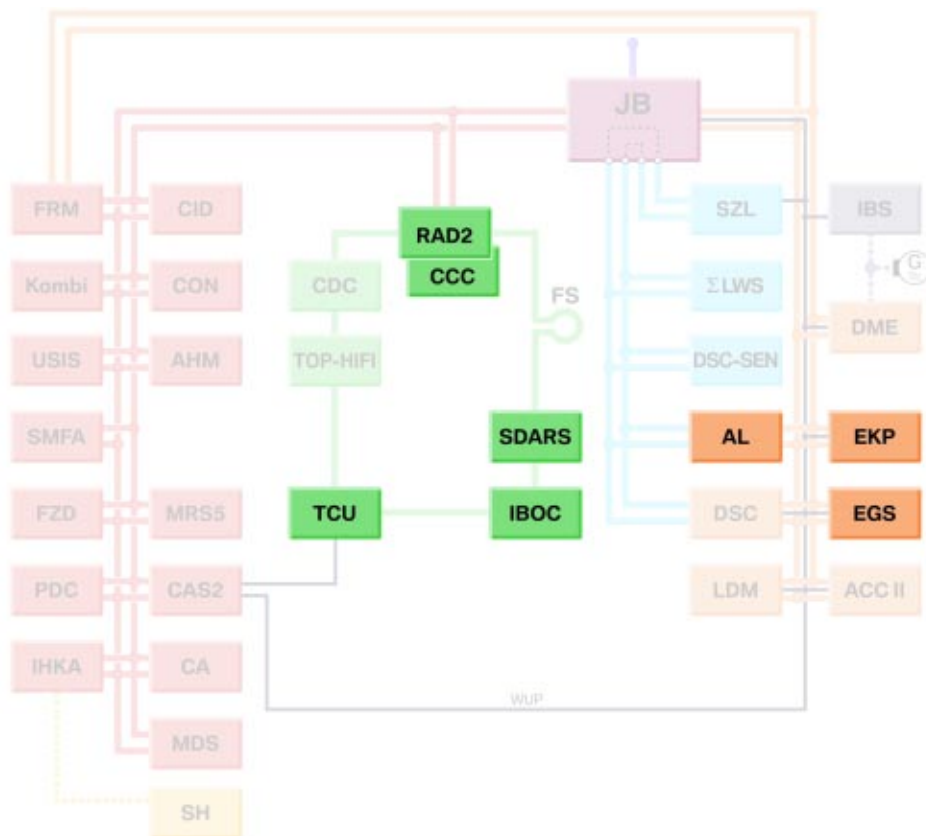
Terminal 30g_f Relay - (fault-dependent deactivation)

The terminal 30g_f relay is activated by the junction box control unit and deactivates the connected electrical loads/consumers as a function of faults.

The terminal 30g_f relay is a bistable relay. Each switching state is retained even at zero current. The characteristics of this relay can be also referred to as an electrical switch that has to be powered to both the on and off positions (it does not have a default position).

The control units on the KL30g_f circuit are:

- Rad2 or CCC
- Sirius Satellite Tuner (SDARS)
- Telematics Control Unit (TCU)
- Digital Radio Control Unit - IBOC (3/2006)
- Electric Fuel Pump Control Unit (EKP)
- Active Front Steering Control Unit (AL)
- Electronic Transmission Control Unit (EGS)



Control Units on the KL30g_f Circuit

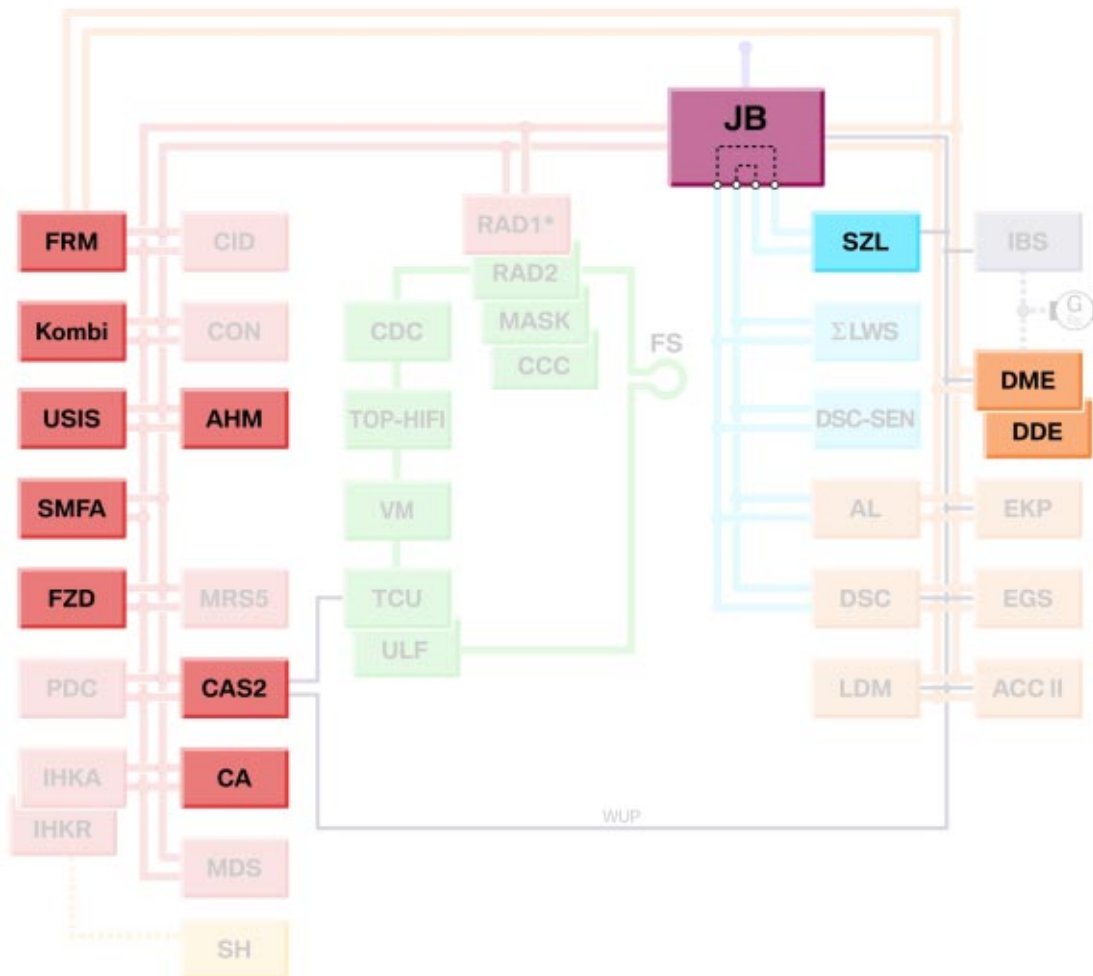
Note: The function of the KL30g_f circuit is the same as the previous micro-power module on the E60.

Terminal 30

From 09/05 the following electrical loads/consumers will no longer be connected to terminal 30. The electrical loads/consumers will then be incorporated in the terminal 30g concept.

The electrical loads/consumers are:

- Multi Drive Sunroof (MDS)
- Active Front Steering (AL)
- Electric Fuel Pump Control Unit (EKP)
- Electronic Transmission Control (EGS)



Control Units no Longer Supplied with Continuous positive (KL30)

Advanced Power Management - Load/Consumer Reduction

If a critically low vehicle voltage is reached, it is possible, in addition to increasing idle speed and raising the charging voltage setpoint value specification, for different electrical loads/consumers to be reduced in terms of their power output or deactivated completely. This allows a reduced power consumption in critical situations.

Load/consumer deactivation takes place under two conditions only:

- Battery charge state in critical range
- Full alternator utilization

Order	Function	Operation	Control Unit
1	Rear window	Clocking	IHKA
2	Seat heating	Stage 2	SM / JB
3	Seat heating	Stage 1	SM / JB
9	Mirror heating	OFF	FRM
10	Rear window	OFF	IHKA
12	Seat heating	OFF	SM / JB

The following measures are activated under these preconditions:

Note: All the measures take place in the order shown.

Heater Blower

The heater blower of the integrated automatic heating/air conditioning can be activated on a reduced level. Reduced activation of the heater blower is dependent on the battery charge state.

The alternator utilization does not have an effect on the reduction.

The IHKA receives a calculated value via the K-CAN from APM. The value expresses the interval to the battery's startability limit "d_SOC". The IHKA implements the request for reduction.

Function	d_SOC	Control unit
Blower output max. 100 %	>+5%	IHKA
Blower reduction max. 75 %	<+5%	IHKA
Blower reduction max. 50 %	<0%	IHKA
Blower reduction max. 25 %	<-5%	IHKA

E91 Body Electronics

The E91 is based to a large extent on the electrics/electronics of the E90. It is therefore assumed in the description of the E91 that you have a sound basic knowledge of the E90.

However, there are changes when compared with the E90.

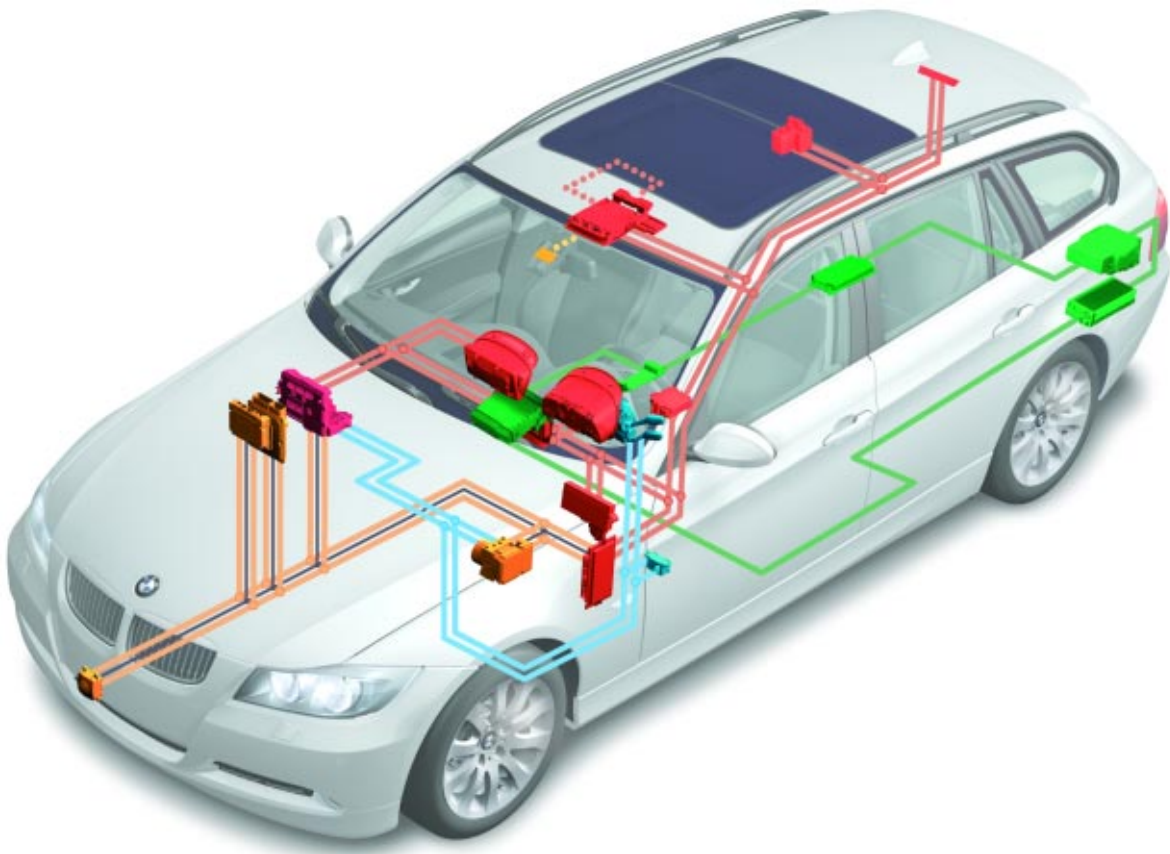
An obvious change is the split rear hatch. With its split rear hatch, the E91 has closing and opening options which are different from those of the E90.

This means that changes are required in the vehicle electrical system and in the central locking.

The MRS 5 multiple restraint system and Personal Profile have been taken over from the E90.

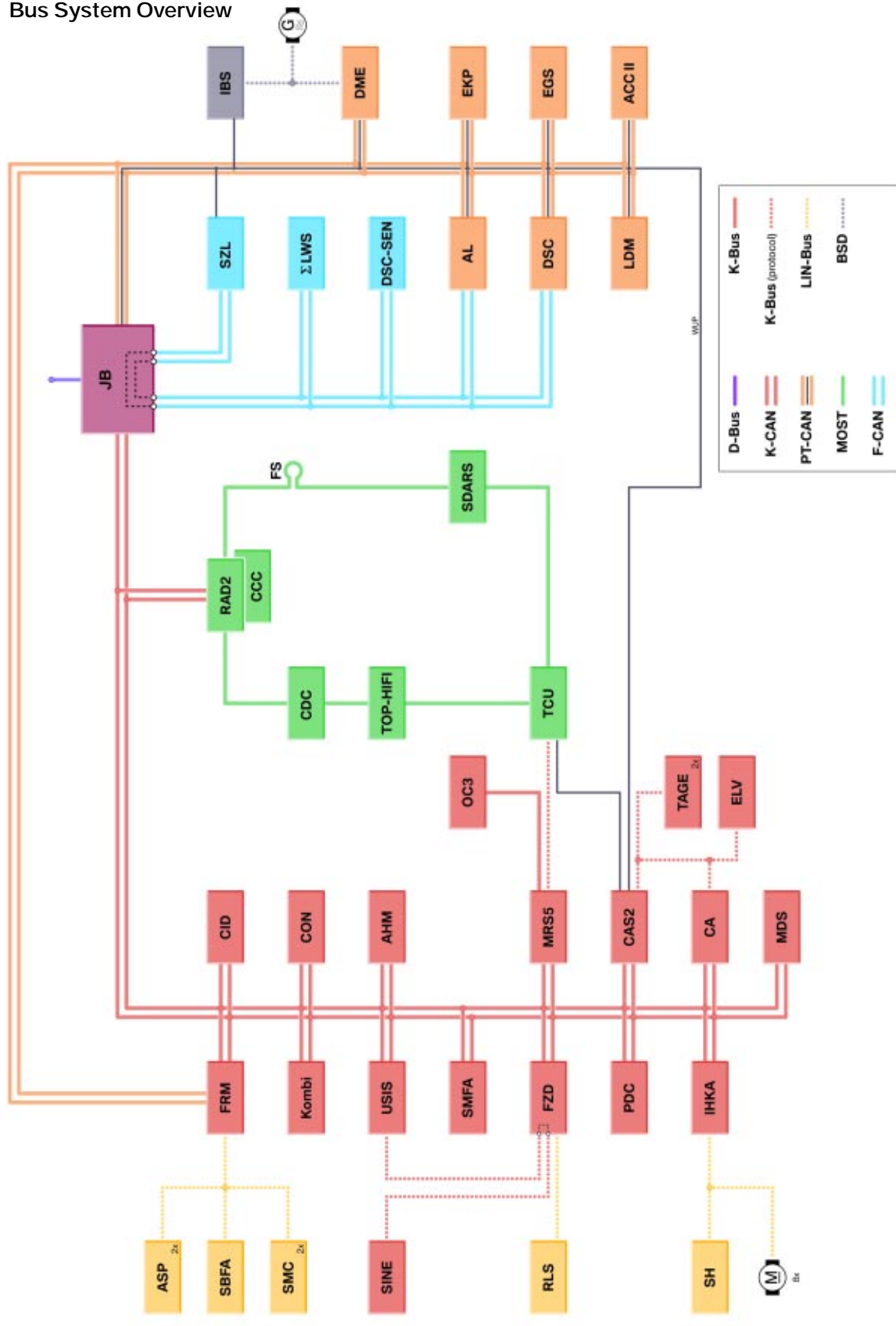
Bus System

The bus system on the E91 has changed to make way for the addition of the MDS control unit.



E91 Bus Routing Overview

E91 Bus System Overview



Central Locking System

The central locking system has been taken over from the E90. The car access system 2 continues to assume the master function for central locking. The junction box control unit activates the central locking. The footwell module makes available the status of the door contacts.

However, the E91 central locking has been adapted to the vehicle. This means that components are added for the split rear hatch and the combination roller blind.

The components in detail are:

- Central locking, rear window
- Rear window button
- Central locking, rear hatch
- Rear hatch button in the rear hatch
- Left and right release motors for combination roller blind

The central locking functions of the split rear hatch and the release feature of the combination roller blind are described in the further course of this publication.

System Components

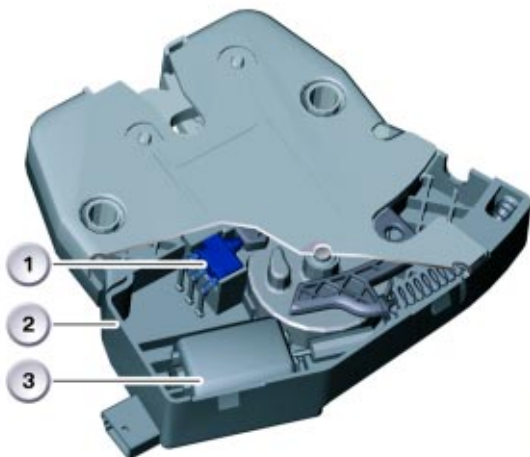


System Components in the Rear Area (vehicle with Comfort Access)

Index	Explanation	Index	Explanation
1	Diversity Module	6	Outer Rear Hatch Button
2	Fuel Filler Flap Motor	7	Rear Window Actuator
3	Comfort Access Control Unit	8	Rear Window Button
4	Comfort Access Antenna	9	Comfort Access Antenna
5	Rear Hatch Actuator		

■ Central Locking Drive Units

The central locking drive units for the rear hatch and rear window are each equipped with a motor for unlocking/locking purposes. The housing of each central locking drive unit accommodates a microswitch which is actuated by the drive mechanism.

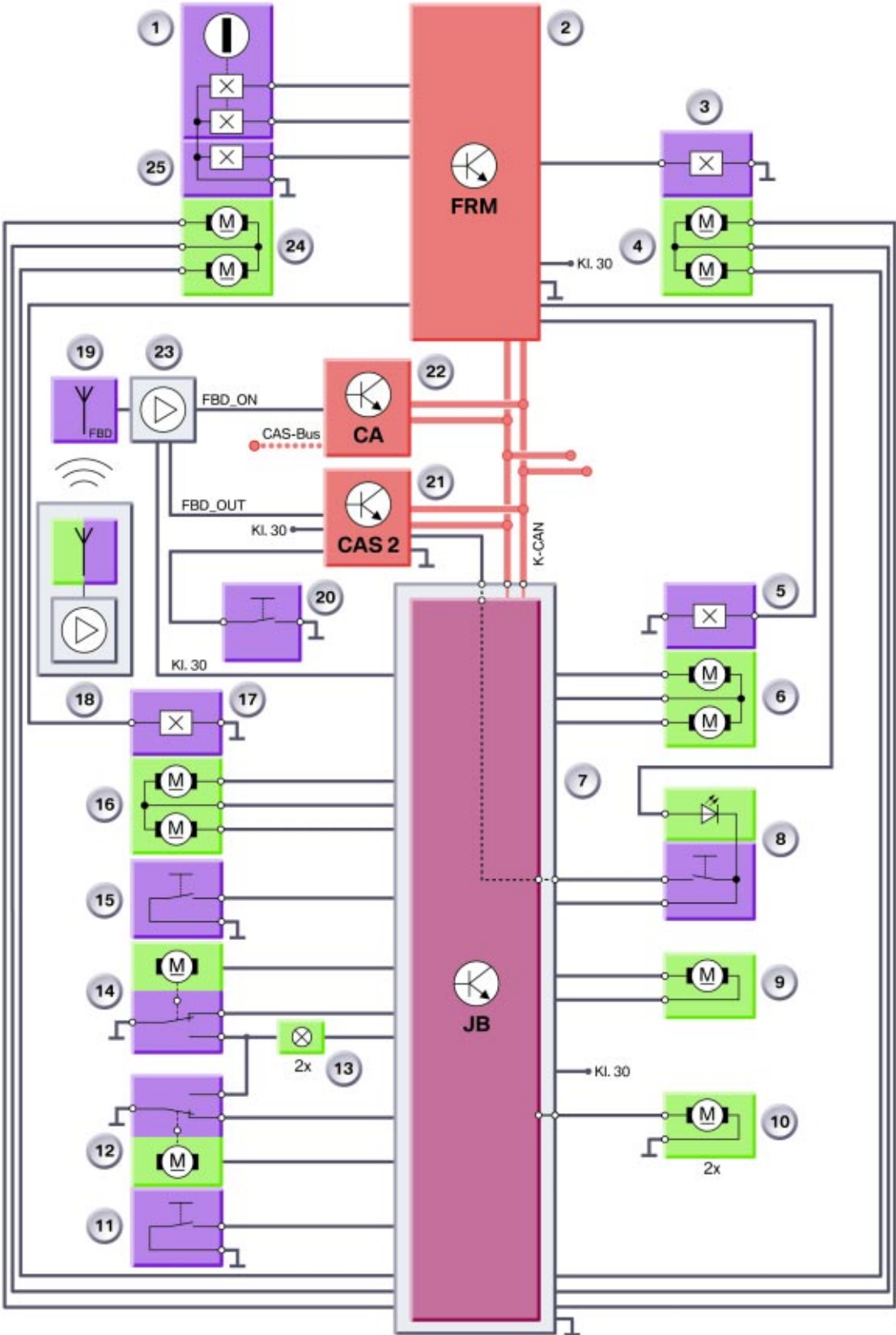


Index	Explanation
1	Microswitch
2	Housing, Central Locking
3	Electric Drive for Latch Release

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Central Locking System Circuit Diagram



Legend for circuit Diagram

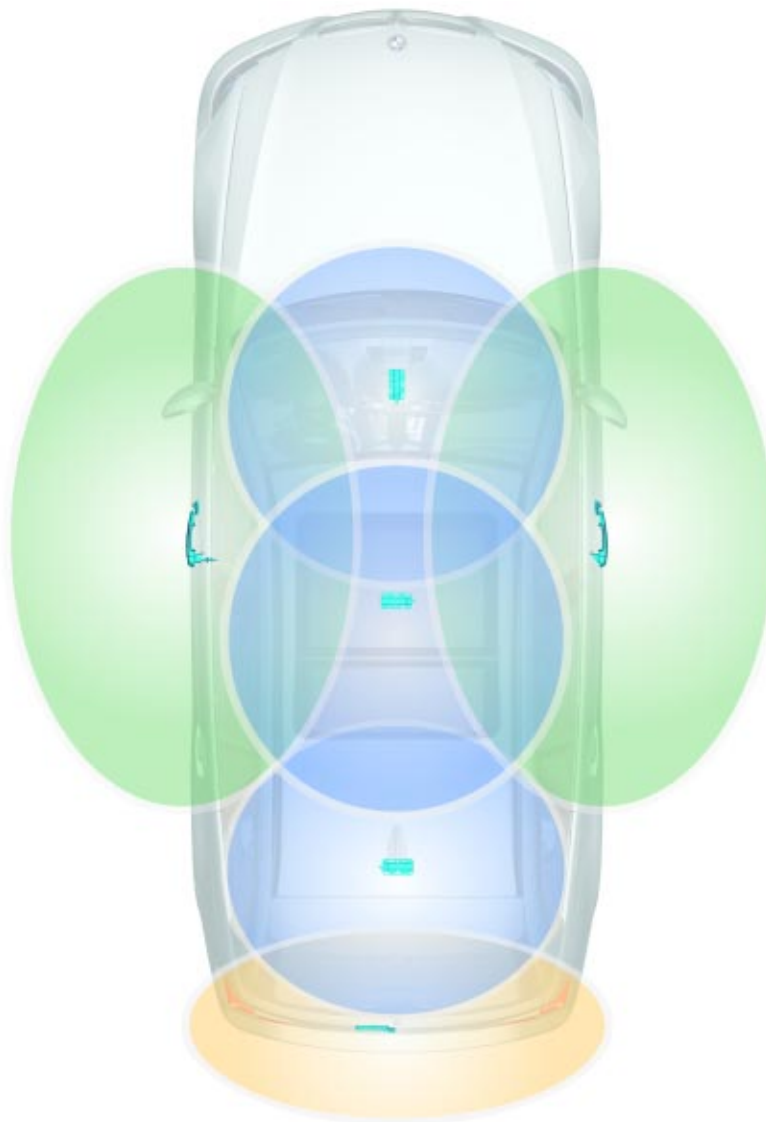
Index	Explanation	Index	Explanation
1	Lock Cylinder, Driver's Door	17	Door Contact, rear driver's side door
2	Footwell Module (FRM)	18	Identification Transmitter
3	Door Contact, passenger's door	19	Rear Window Antenna
4	Central Locking, passenger's door	20	Interior Button for Rear Hatch
5	Door Contact, rear passenger's side door	21	CAS 2
6	Central Locking, rear passenger's door	22	Comfort Access (CA)
7	Junction Box Control Unit (JB/JBE)	23	Remote Control Receiver
8	Central Locking Button	24	Central Locking, driver's door
9	Central Locking, fuel filler flap	25	Door Contact, driver's door
10	Motors, luggage compartment cover	K-CAN	Body Controller Area Network
11	Rear Window button	KL30	Terminal 30 (hot at all times)
12	Central Locking, Rear Window	CAS-Bus	Car Access System Bus
13	Luggage Compartment Lights	FBD	Remote Control Services
14	Central Locking, rear hatch	FBD ON	Remote Control Services ON
15	Button, rear hatch, exterior	FBD OUT	Remote Control Services OUT
16	Central Locking, rear driver's side door		

Comfort Access

Comfort Access is available as an option for the E91.

The system consists of:

- Two front door handles with antenna (TAGE)
- Comfort Access Control Unit
- Four additional antenna

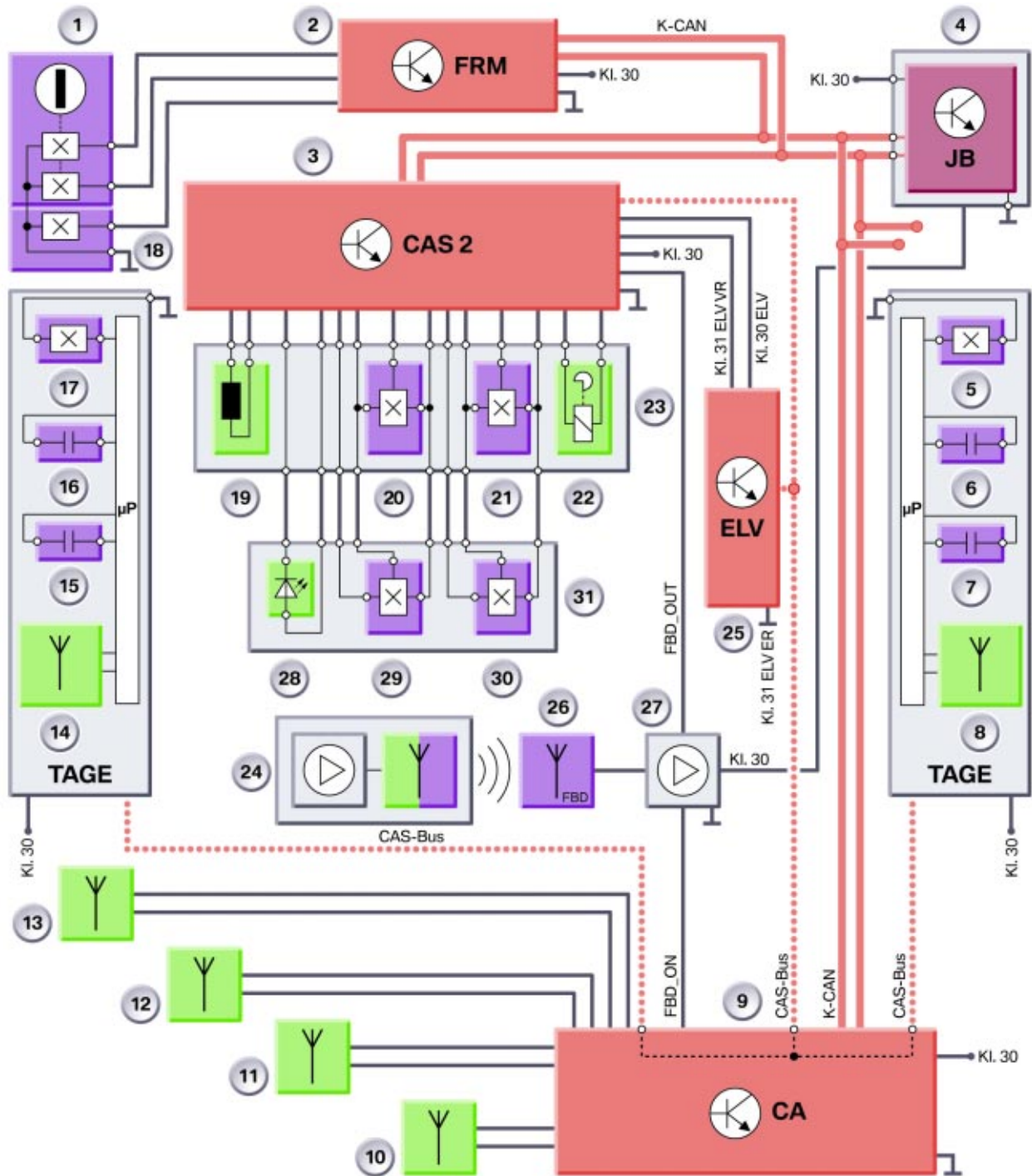


Comfort Access Antenna Locations

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Comfort Access System Circuit Diagram



Comfort Access System Circuit Diagram

Index	Explanation	Index	Explanation
1	Lock Cylinder, Driver's Door	21	Hall Sensor in Identification Transmitter in Slot
2	Footwell Module (FRM)	22	Identification Transmitter Locked in Slot
3	CAS 2	23	Identification Transmitter Slot
4	Junction Box Control Unit (JB/E)	24	Identification Transmitter
5	TAGE Antenna, front passenger's side	25	Electronic Steering Lock (ELV)
6	TAGE capacitive Sensor, front passenger's side	26	Rear Window Antenna
7	TAGE capacitive Sensor, front passenger's side	27	Remote Control Receiver
8	TAGE, Hall Sensor, front passenger's side	28	LED START/STOP Button
9	Comfort Access (CA)	29	Hall Sensor, START/STOP Button
10	Exterior Antenna	30	Hall Sensor, START/STOP Button
11	Luggage Compartment Antenna	31	START/STOP Button
12	Interior Antenna, front	CAS-bus	Car Access System Bus
13	Interior Antenna, rear	K-CAN	Body Controller Area Network
14	TAGE Antenna, driver's side	KL30	Terminal 30 (hot at all times)
15	TAGE capacitive Sensor, driver's side	KL30 ELV	Terminal 30 ELV (positive supply)
16	TAGE capacitive Sensor, driver's side	KL31 ELV ER	Terminal 31 ELV unlocking (ground connection)
17	TAGE, Hall Sensor, driver's side	KL31 ELV VR	Terminal 31 ELV locking (ground connection)
18	Door Contact	FBD	Remote Control Services
19	Transponder Coil	FBD ON	Remote Control Services ON
20	Hall Sensor in Identification Transmitter in Slot	FBD OUT	Remote Control Services OUT

■ Output FBD_ON

Comfort access uses the output FBD_ON to enable communication to take place between the identification transmitter and the vehicle.

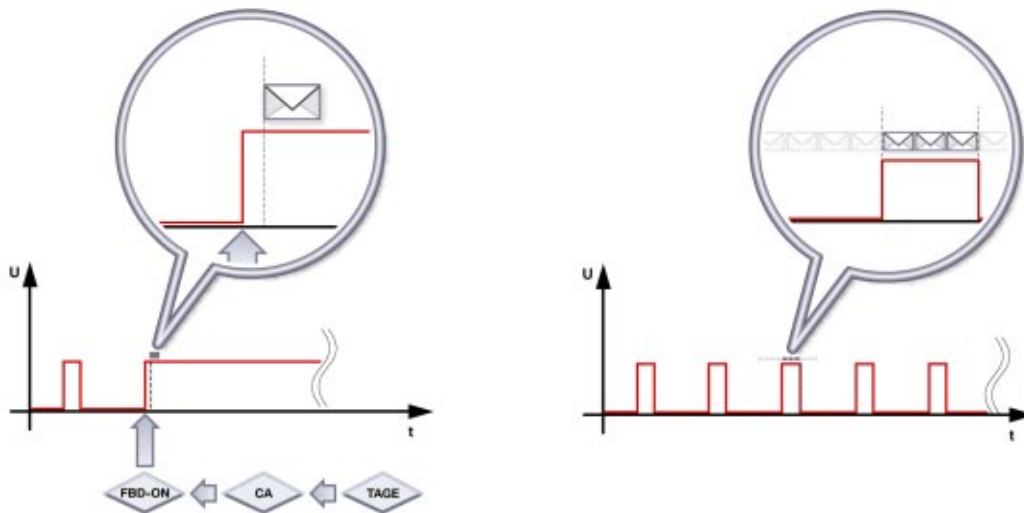
Comfort access activates the output FBD_ON when it identifies a request (when the sensitive outer surface of the outer door handle is touched) for unlocking or locking. This output is directly connected to the remote control receiver and supplies it with vehicle voltage.

Shortly afterwards, the identification transmitter is prompted by comfort access to authenticate itself. To authenticate itself, the identification transmitter only transmits a telegram within a very narrow, precisely tuned period of time.

After the end of the telegram, the remote control receiver only remains briefly activated in order to receive new telegrams. The remote control receiver is deactivated if no new telegrams are received.

Note: In the interest of reducing power consumption, the remote control receiver is deactivated/activated at cyclical intervals.

In the event of a prompt with the remote control, 10 telegrams are transmitted for authentication. The transmission is configured so that there are at least three telegrams in the cyclical ON time of the remote control receiver. Reception of the three telegrams is sufficient for the remote control to be able to authenticate itself.



FBD Receiver ON with CA

FBD Receiver with Remote Control

Index	Explanation	Index	Explanation
TAGE	Electronic Outer Door Handle Module	U	Voltage, Remote Control Receiver
CA	Comfort Access	t	time
FBD_ON	Power Supply		

Wipers

The front wipe/wash system has been taken over from the E90. The rear wipe/wash system is derived from the E87 and has been adapted to the E91.

Each of the wiper motors is equipped with a reset contact.

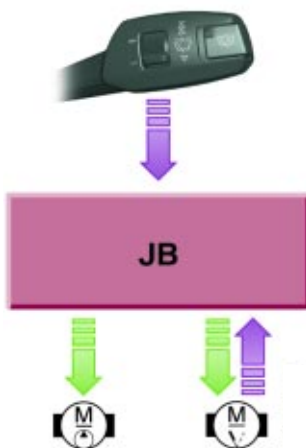
Wiper Switch

The wipe/wash system is switched on and off with the wiper switch. The wiper switch is an integral part of the steering column switch cluster SZL.

The function of the wipe/wash system has been taken over from the E90. Therefore only rear wiping is explained in the following.

The following functions are switched on with the wiper switch:

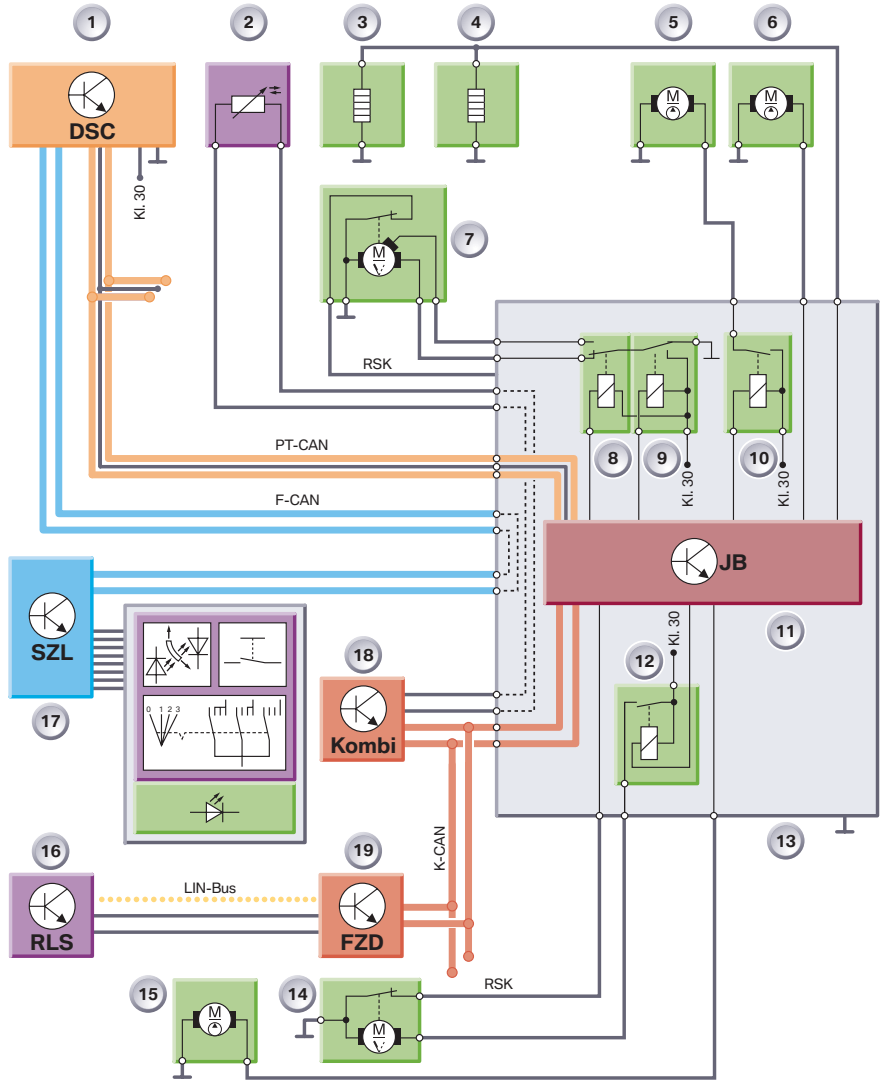
- Wipe rear window
- Wash rear window



The signals of the wiper switch are sent from the steering column switch cluster via the FCAN to Dynamic Stability Control.

The signal is then transferred from Dynamic Stability Control via the PT-CAN to the junction box control unit. The junction box control unit evaluates the signals and activates the wiper motor for example.

Wiper System Circuit Diagram



Index	Explanation	Index	Explanation
1	DSC Control Unit	11	JBE
2	Outside Temperature Sensor	12	Relay for Rear Wiper Motor
3	Heated Washer Jet, Left	13	JB
4	Heated Washer Jet, Right	14	Rear Window Wiper Motor
5	Headlamp Washer Pump	15	Rear Washer Fluid Pump
6	Front Windshield Washer Fluid Pump	16	RLS
7	Wiper Motor	17	SZL and Wiper Stalk Switch
8	Relay 1 Front Wiper Motor	18	Instrument Cluster
9	Relay 2 (soldered) Front Wiper Motor	19	FZD
10	Relay, Headlamp Washer System	RSK	Reset Contact

Functional Description

■ Wiping the Rear Window

The rear window wipe function is switched on with the wiper switch by pressing the stalk forward.

■ Intermittent Wipe

The intermittent wipe function of the rear window wiper is started by pressing the wiper switch forward.

The optical signal from the steering column switch is evaluated by the steering column switch cluster which sends the signal on the F-CAN to the DSC control unit. From Dynamic Stability Control, the signal is made available on the PT-CAN.

The junction box receives the signal and correspondingly activates the rear window wiper. The junction box control unit detects the rest position (park position) of the wiper by means of the reset contact in the rear window wiper.

■ Continuous Wipe

During intermittent wipe the rear window wiper switches over to continuous wipe when reverse gear is engaged.

For safety reasons, operation of the rear window wiper is terminated when the rear hatch or rear window is opened. The wiper must then be switched on again.

■ Rear Antiblocking Function

The antiblocking function is integrated in the junction box control unit.

If the signal is not sent from the reset contact while the wiper motor is running, this is interpreted as a blocking situation. The junction box control unit evaluates the signal from the reset contact for the antiblocking function.

The junction box control unit switches off the blocking motor. A further attempt can be made to switch on the wiper. If the wiper blocks again, it will no longer be operative for approx. 3 minutes.

The wiper inhibit is cancelled by changing from terminal R ON to terminal R OFF and terminal R ON. The wiper must then be switched on again.

■ Rear Window Wash Function

The rear window wash function is started by overpressing the wiper switch forward.

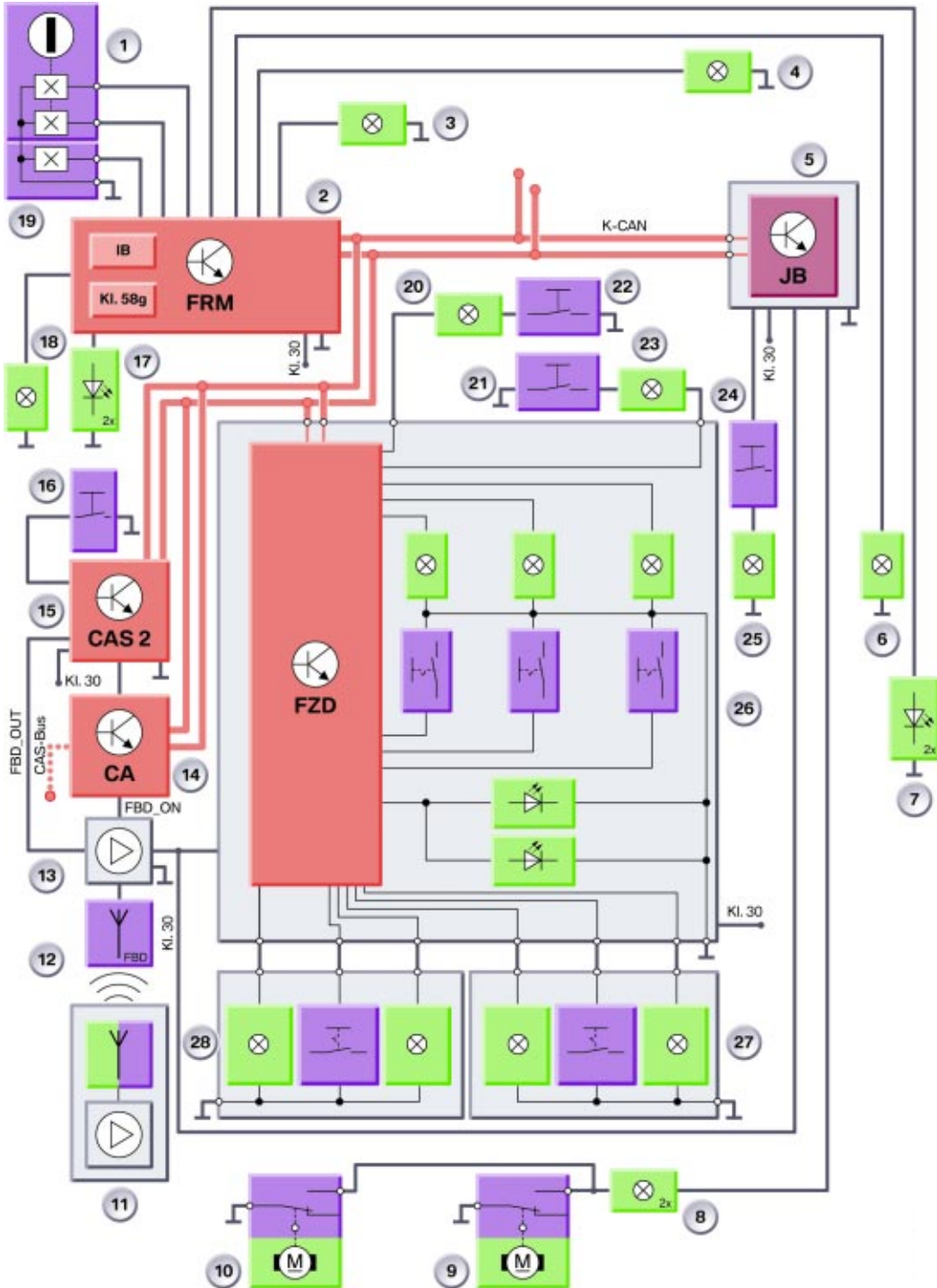
Initially, the washer fluid pump for the rear window is activated, followed by the rear window wiper switching on.

The wipe function set before the start of the wash cycle and after the end of the wash function is continued again.

Interior Lights

As on the E90, these interior lights are connected directly to the roof function center (FZD). The interior lighting comprises an interior light each on the left and right sides.

Interior Light circuit Diagram



Legend for Interior Light circuit Diagram

Index	Explanation	Index	Explanation
1	Lock Cylinder, Driver's Door	19	Door Contact
2	Footwell Module (FRM)	20	Vanity Mirror Light, driver's side
3	Footwell Light, driver's side	21	Switch for Vanity Light, driver's side
4	Footwell Light, front passenger's side	22	Switch for Vanity Light, passenger's side
5	Junction Box Control Unit (JB/JBE)	23	Vanity Mirror Light, passenger's side
6	Exit Light, passenger's side	24	Switch for Glove Compartment Lighting
7	Courtesy Lighting, front passenger's side	25	Glove Compartment Light
8	Luggage Compartment Lights	26	Roof Function Center (FZD) with Front Interior Light
9	Central Locking, rear window	27	Interior Light, rear right
10	Central Locking, rear hatch	28	Interior Light, rear left
11	Identification Transmitter	K-CAN	Body Controller Area Network
12	Rear Window Antenna	KL30	Terminal 30 (hot at all times)
13	Remote Control Receiver	KL58g	Terminal 58g (backlighting)
14	Comfort Access (CA)	IB	Interior Lighting
15	CAS 2	FBD	Remote Control Services
16	Rear Hatch Button, interior	FBD ON	Remote Control Services ON
17	Courtesy Lighting, driver's side	FBD OUT	Remote Control Services OUT
18	Exit Light, driver's side	2x	Courtesy Lighting, front and rear

Rear Interior Lights

The rear interior lights are equipped with an ON/OFF button, an interior light and a reading light. The interior lights do not have an ON LED.

■ Interior Light Function

The roof function center switches the rear interior lights on or off when prompted by the footwell module. The prompt is received via the K-CAN. The Soft On and Soft Off facility is integrated in the footwell module.

■ Reading Light Function

The reading light is switched on and off when the button is pressed. The roof function center provides the power supply for the reading lights.

The main interior lighting function is in the footwell module. The control units for the roof functions center and car access system 2 only supply input and output signals. The junction box control unit activates the luggage compartment lighting.



Installation location of rear interior light on driver's side (passenger side symmetrical)

Index	Explanation
1	Interior Light
2	Reading Light
3	Reading Light Button

■ Luggage Compartment Lights

The luggage compartment lights are installed in the left and right D-pillars and in the rear hatch.

The luggage compartment lights are switched on when the rear window or rear hatch is unlocked. A microswitch in the central locking unit switches to ground. The microswitch is mechanically connected to the central locking drive unit.

The junction box control unit detects the microswitch status and supplies the luggage compartment lights with vehicle voltage.



Index	Explanation
1	Lamp, Right
2	Lamp Left
3	Rear Hatch Lamp

The light in the rear hatch fulfills two functions.

Firstly, it illuminates the luggage compartment and, secondly, it acts as a red signal light for road traffic behind the vehicle.

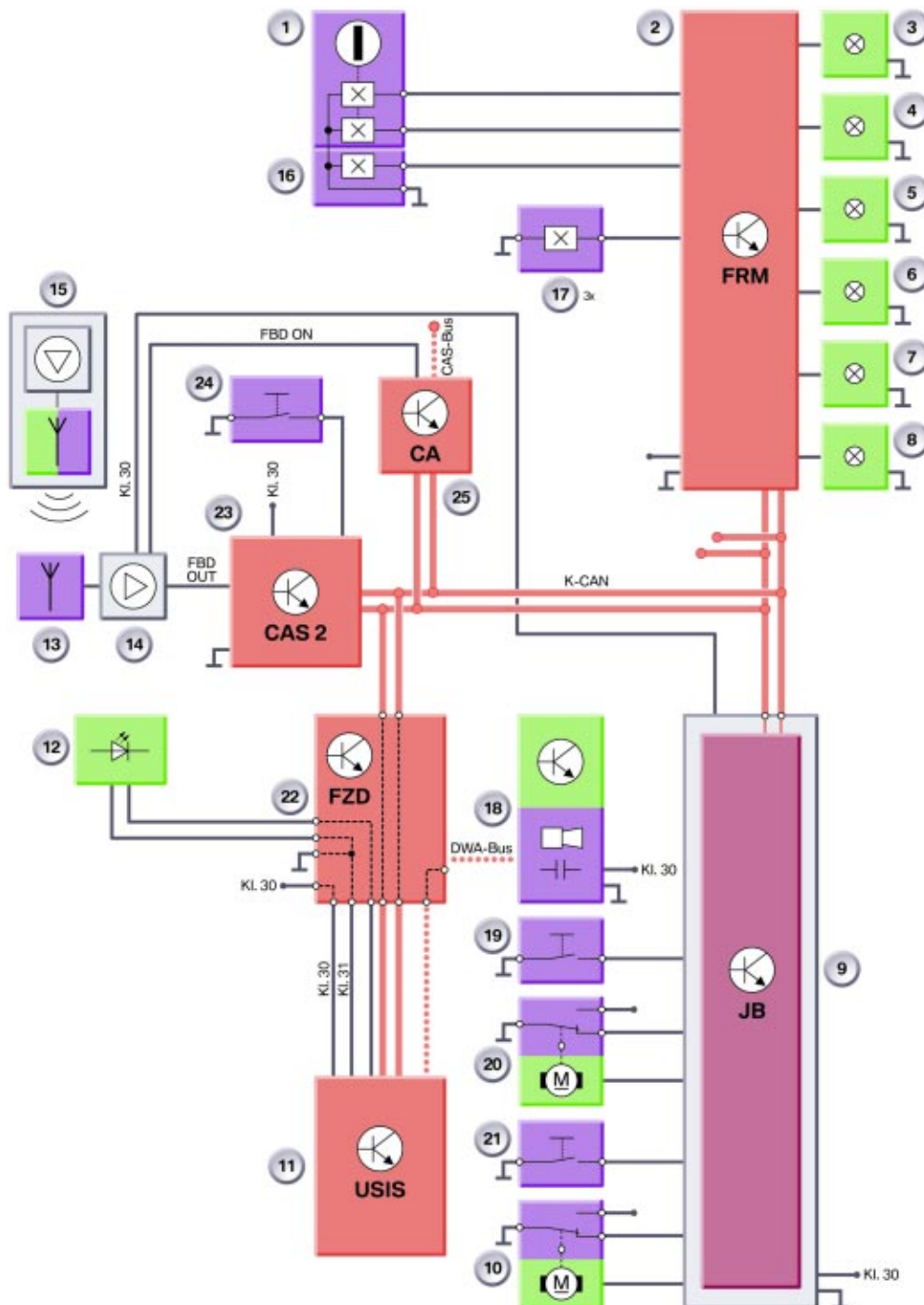


Index	Explanation
1	Rear Hatch Lamp

Drive Away Protection (DWA)

The alarm system on the E91 has been adopted from the E90 sedan with the exception of the ultrasonic interior sensor (USIS). The USIS has been adopted from the E65.

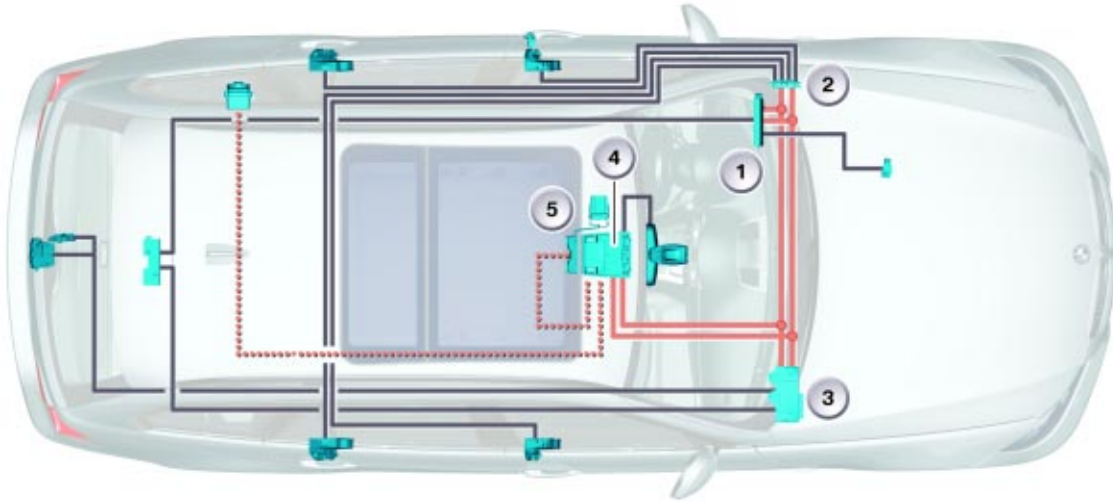
Alarm System Circuit Diagram



Legend for Alarm System Circuit Diagram

Index	Explanation	Index	Explanation
1	Lock Cylinder, driver's door	18	Emergency Current Siren with Integrated Tilt Alarm Sensor
2	Footwell Module (FRM)	19	Rear Window Button
3	Direction Indicator Repeater, right	20	Central Locking, rear window
4	Headlamp, right	21	Button, rear hatch, outer
5	Headlamp, left	22	Roof Function Center (FZD)
6	Direction Indicator Repeater, left	23	CAS 2
7	Tail Light, right	24	Hood Contact Switch
8	Tail Light, left	25	Comfort Access (CA)
9	Junction Box Control Unit (JB/E)	DWA-Bus	DWA Bus (K-bus protocol)
10	Central Locking, rear hatch	CAS-Bus	CAS Bus (K-bus protocol)
11	Ultrasonic Interior Sensor (USIS)	K_CAN	Body Control Area Network
12	Anti-theft Alarm LED	KL30	Terminal 30 (hot at all times)
13	Rear Window Antenna	KL31	Terminal 31 (ground)
14	Remote Control Receiver	FBD	Remote Control Services
15	Identification Transmitter	FBD ON	Remote Control Services ON
16	Door Contact, driver's door	FBD OUT	Remote Control Services OUT
17	Passenger's door contact, rear left/right doors		

System Components



Index	Explanation	Index	Explanation
1	CAS2	4	FZD
2	FRM	5	USIS
3	JBE		

■ Ultrasonic Interior Protection Sensor (USIS)

The USIS is now mounted in the front lamp assembly (E90 center lamp assembly).



Index	Explanation
1	Ultra Sonic Interior Sensor (USIS)

Information and Communication Technology

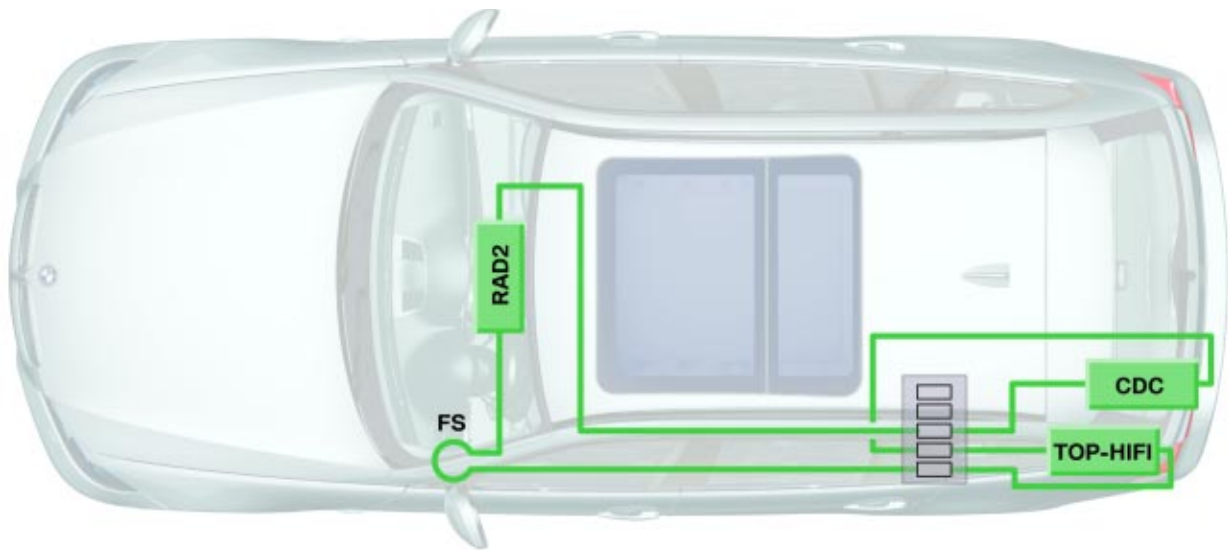
The information and communication technology system installed in the E91 has been adopted from the E90 sedan.

Some minor differences due to the change inherent from a Sports Wagon are:

- From 9/2005 the CCC will be .mp3 and .wma file compatible
- The rear speakers locations in the vehicle.
- The aerials/antennas locations.

In this section the following items will be discussed:

- Audio Sources
- Audio Systems (HiFi and Top-HiFi)
- Car Communication Computer
- Antenna/ Aerials



Audio Systems

A HiFi and Top HiFi amplification system is available (similar to the E90) depending on equipment level (RAD 2 / CCC).

The E91 will come equipped with facilities for the following:

- pre-wired for CD Changer (mounted in the luggage compartment)
- pre-wired for a Sirius Satellite Radio tuner
- high definition radio module (IBOC - In Band - On Channel March of 2006)

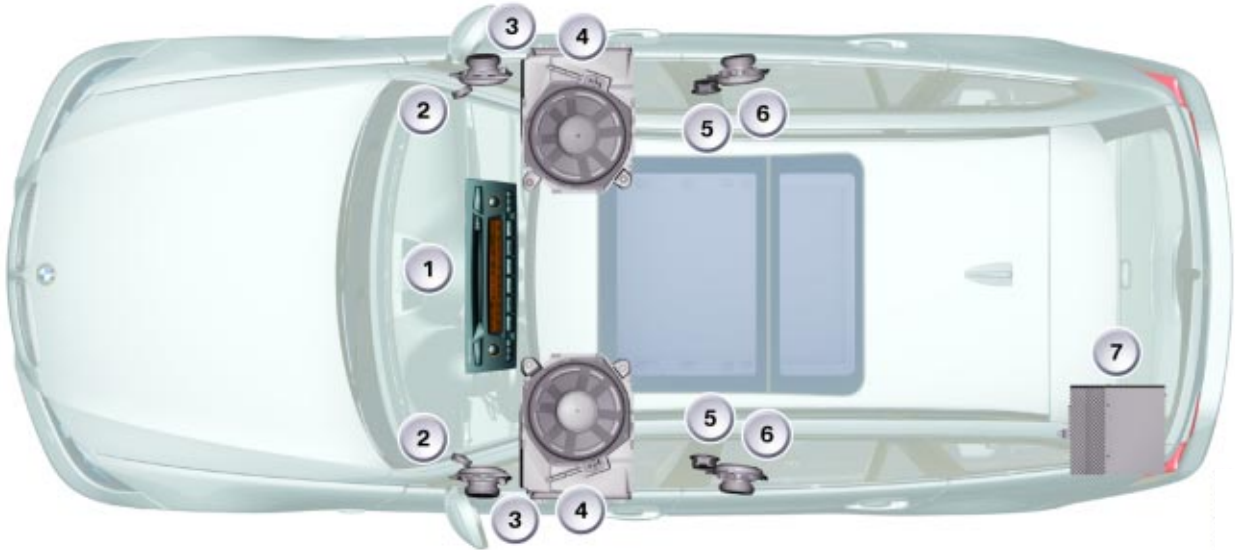
HiFi

The RAD 2 audio source (radio) comes standard with a HiFi audio amplification system.

This is a 10 speaker 180 Watt setup activated via 6 audio channels of the analog auxiliary amplifier:

- One tweeter and one mid-range speaker in both of the front doors
- One tweeter and one mid-range speaker in both of the rear doors
- One central woofer under both of the front seats

The amplifier is externally mounted receives audio signals directly from the RAD 2 via a hardwire connection.

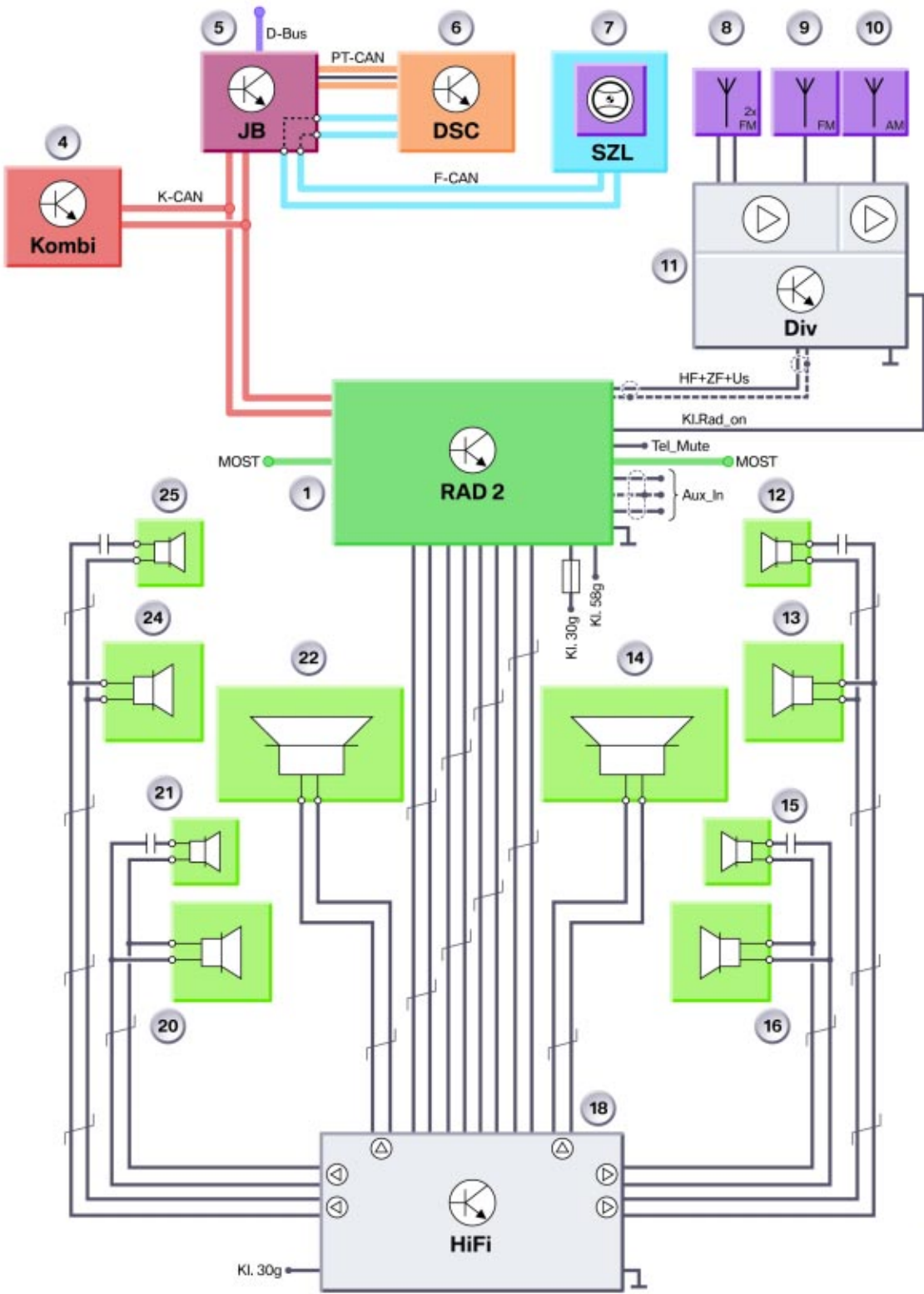


Index	Explanation	Index	Explanation
1	RAD 2	5	Tweeter, rear
2	Tweeter, front	6	Mid-Range Speaker, rear
3	Mid-Range Speaker, front	7	HiFi Amplifier
4	Central Woofer		

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System circuit Diagram (HiFi)



Legend for System circuit Diagram (HiFi)

Index	Explanation	Index	Explanation
1	RAD 2	18	HiFi Amplifier
4	Instrument Cluster	20	Mid-Range Speaker, rear left door
5	Junction Box (JB/E)	21	Tweeter, rear left door
6	Dynamic Stability Control (DSC)	22	Central Woofer, left
7	Steering Column Switch Center	24	Mid-Range Speaker, front left door
8	FM2, FM3 Antenna	25	Tweeter, front left door
9	FM1 Antenna	MOST	Media Oriented Systems Transport
10	AM Antenna	HF	Hi- Frequency Signal
11	Antenna Amplifier with Diversity Module	ZF	Intermediate Frequency Signal
12	Tweeter, front right	Us	Changeover Voltage, AM/FM Antenna Diversity Operation
13	Mid-Range Speaker, front right	Aux_In	Audio Input for Additional Sources
14	Central Woofer, right	Tel-Mute	Radio During Telephone Operation
15	Tweeter, rear right	KL Radio_on	Control signal or Power Supply
16	Mid-Range Speaker, rear right door		

Top HiFi

The option for the Top HiFi audio system is available with a RAD 2 audio source (radio) and comes standard in a CCC equipped vehicle.

This is a 13 speaker 420 Watt setup activated via 9 audio channels of the digital auxiliary amplifier:

- One tweeter and one mid-range speaker in both of the front doors
- One tweeter and one mid-range speaker in both of the rear doors
- One electro-dynamic speaker in both of the left and right rear roofliners
- One mid-range speaker in the instrument panel
- One central woofer under both of the front seats

The amplifier is externally mounted (in the luggage compartment) and receives audio signals on the MOST bus. This system is sometimes referred to as the Logic7 system.



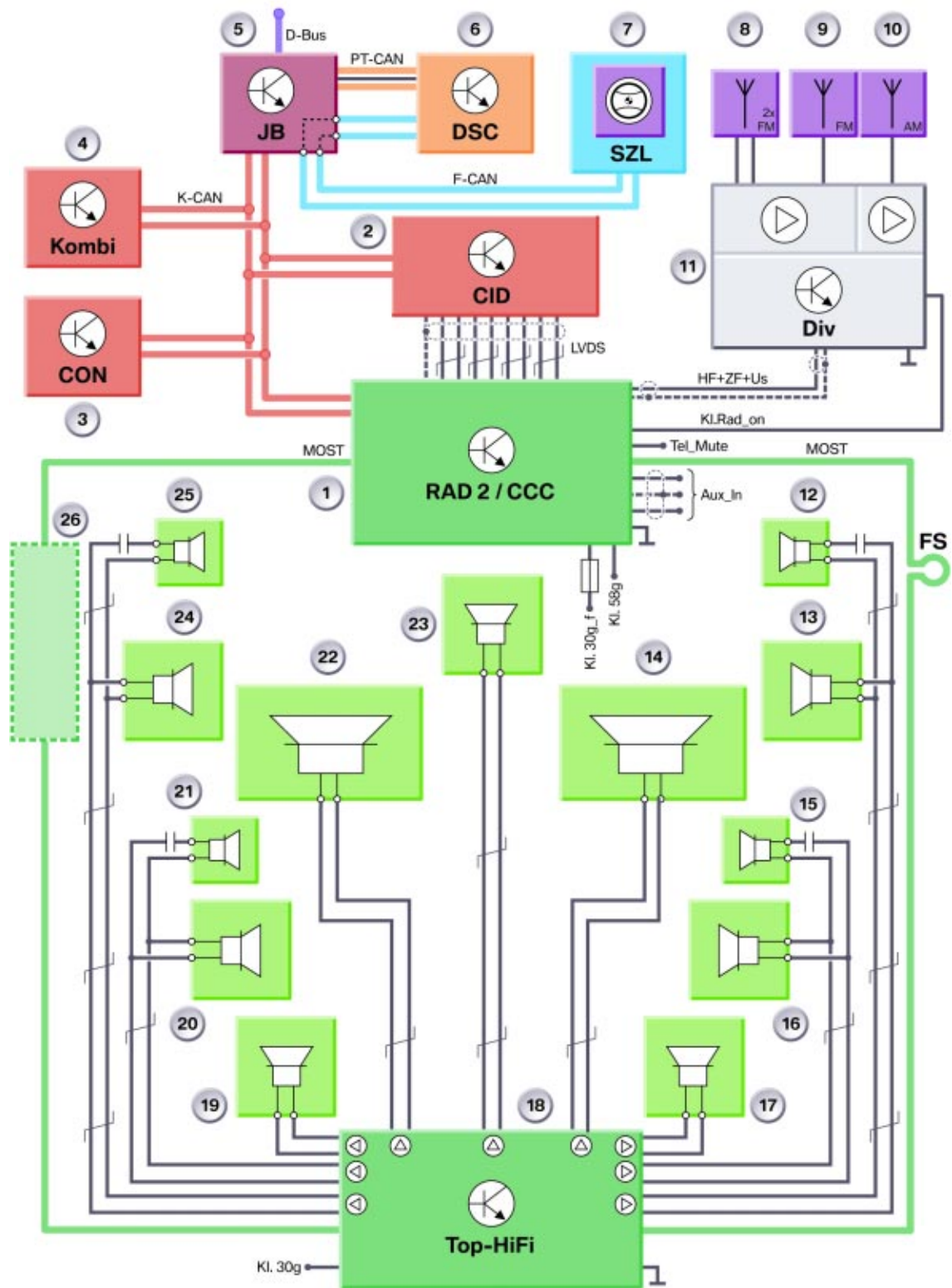
Index	Explanation	Index	Explanation
1	RAD 2 or CCC	6	Mid-Range Speaker, rear
2	Tweeter, front	7	Electro-Dynamic Planar Speakers
3	Mid-Range Speaker, front	8	Top HiFi (Logic7) Amplifier
4	Central Woofer	9	Mid-Range Speaker, center
5	Tweeter, rear	10	Central Information Display (CID)

Note: If there is no audio playback after the RAD 2 or the Car Communication Computer have been replaced, the component must be coded to the Top HiFi system.

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System circuit Diagram (Top HiFi)



Legend for System circuit Diagram (Top HiFi)

Index	Explanation	Index	Explanation
1	RAD 2 or CCC	18	Top HiFi Amplifier
2	Central Information Display (CID)	19	Electro-Dynamic Planar Speaker (EDPL), rear left
3	Controller	20	Mid-Range Speaker, rear left door
4	Instrument Cluster	21	Tweeter, left rear door
5	Junction Box (JB/E)	22	Central Woofer, left
6	Dynamic Stability Control (DSC)	24	Mid-Range Speaker
7	Steering Column Switch Center	25	Tweeter, front left door
8	FM2, FM3 Antenna	26	Other MOST Components
9	FM1 Antenna	MOST	Media Oriented Systems Transport
10	AM Antenna	HF	Hi- Frequency Signal
11	Antenna Amplifier with Diversity Module	ZF	Intermediate Frequency Signal
12	Tweeter, front right door	Us	Changeover Voltage, AM/FM Antenna Diversity Operation
13	Mid-Range Speaker, front right door	Aux_In	Audio Input for Additional Sources
14	Central Woofer, right	Tel-Mute	Radio During Telephone Operation
15	Tweeter, rear right door	KL Radio_on	Control signal or Power Supply
16	Mid-Range Speaker, rear right door	FS	MOST Access Point
17	Electro-Dynamic Planar Speaker (EDPL), rear right	LVDS	Low Voltage Differential Signal

CCC

■ Playback of MP3 and WMA Files

The RAD 2 has supported the playback of MP3 and WMA files from the time the E90 was introduced.

Now, the CCC playback capabilities have improved. The CD drive and the DVD drive can not only play back normal audio-CDs but also play CDs with compressed audio data in the formats MP3 and WMA.

Information such as folder name, music track or artist are shown in the display. Detailed information based on ID3 tags can also be displayed. ID3 tags are pieces of additional information which are added to the music data.

A track display for an MP3 CD is shown in the following.



CID Display of the CCC (DVD drive) during .mp3 Playback

CD Changer

A "6-slot CD changer" (CDC) is offered as an option or accessory on the E91. The changer is a user in the MOST network and supports the playback of MP3 and WMA CDs.

Electro-Dynamic Planar Speaker

Two speakers are installed in the roofliner to deliver perfect Surround Sound under all load conditions in the luggage compartment.

Because of the narrow installation depth, the new concept of the electro-dynamic planar speaker has been used.

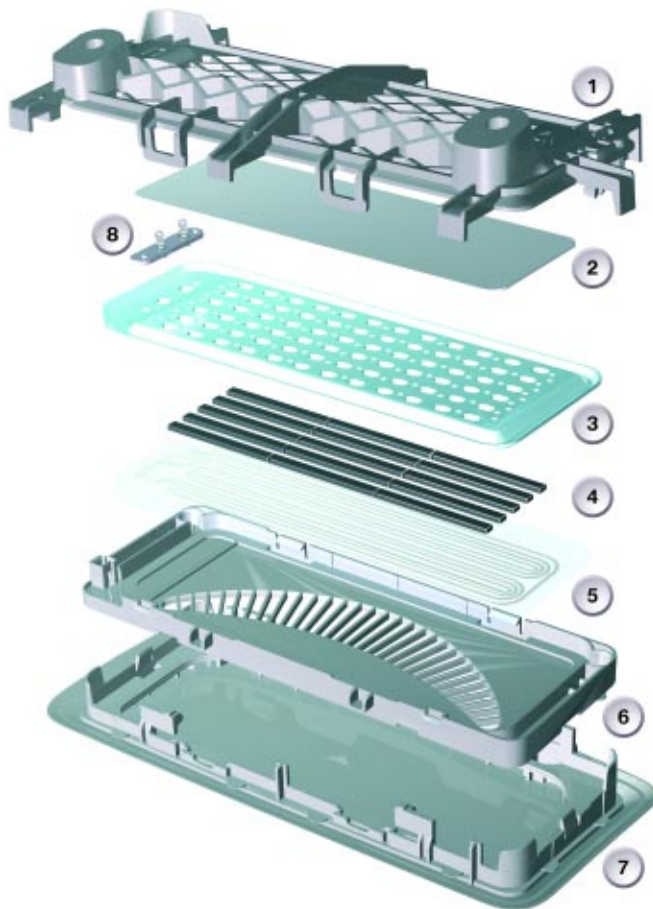
An acoustic lens is used in order to adapt the radiating characteristic of the speaker to the vehicle-specific factors. This results in a uniform distribution of the sound pressure in the rear passenger area.

■ Design of the Electro-Dynamic Planar Speaker

The electro-dynamic planar speaker is designed in such a way that all the moving components are situated on a single "film diaphragm". This brings about an installation depth of just 6 mm.

In order for the speaker to be able to generate the necessary sound pressure compared with a conventional speaker, the diaphragm surface must be larger than that of conventional speakers.

The following graphic shows the basic design of the electro-dynamic planar speaker.



Index	Explanation
1	Housing Back
2	Insulation Material
3	Frame
4	Neodym Magnet Rods
5	Film Diaphragm with Coil
6	Acoustic Lens
7	Cover
8	Speaker Connection

Neodym Magnet Rods

The advantages of neodym magnet rods over conventional magnet rods are:

- Better efficiency
- Lower weight
- Low magnet stray field

Acoustic Lens

The function of the acoustic lens is to distribute the sound pressure of the electrodynamic planar speaker uniformly in the vehicle.

The following graphic shows what effects the acoustic lens has on sound distribution.

The radiating characteristic of the speaker is influenced by its structural design and the acoustic lens. Damage to the acoustic lens has a negative effect on sound properties.



Index	Explanation	Index	Explanation
1	Sound Distribution without Acoustic Lens	2	Sound Distribution with Acoustic Lens

■ Variants

The following identifying abbreviations for the different variants can be found on the trim and the housing back:

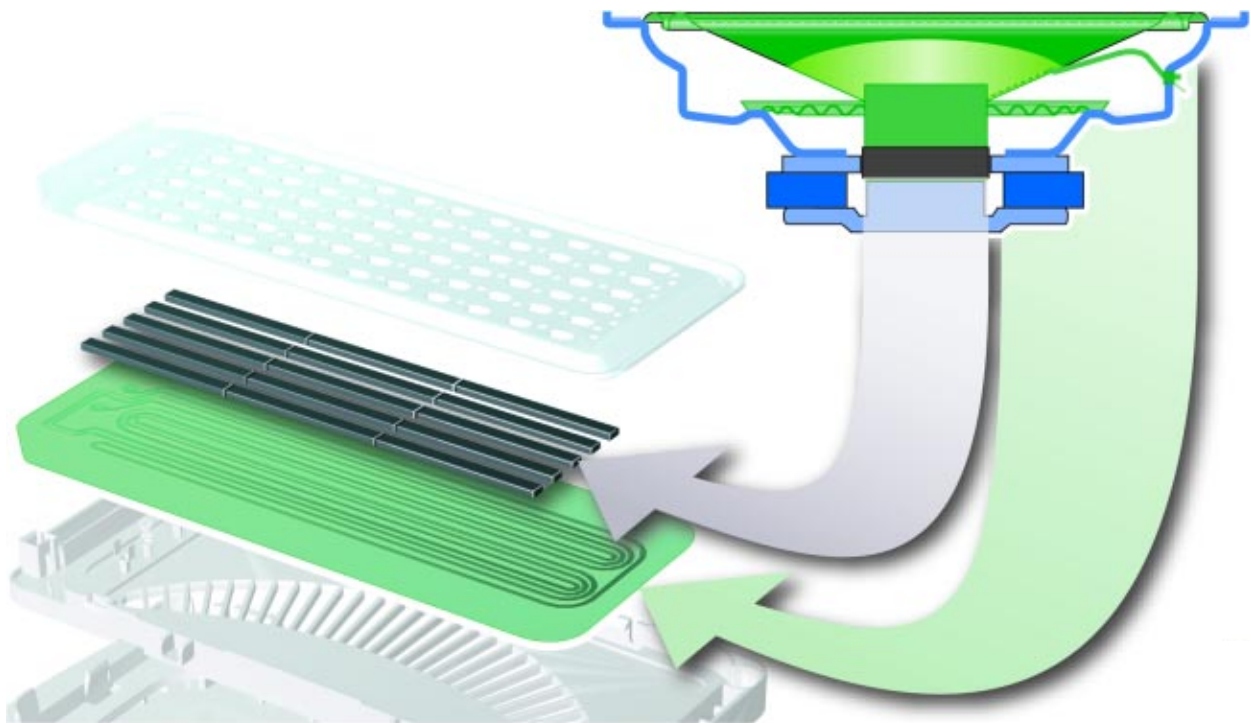
- ND for normal roof (not for US)
- PD for panorama glass sunroof
- LI for installation on left side
- RE for installation on right side

■ Principle of Operation of the Electro-Dynamic Speaker

The functions of the moving components (shown in green) of the conventional speaker are combined in a single component in the electro-dynamic planar speaker. This component is the film diaphragm (shown in green) with the coil arrangement on top.

The function of the speaker magnet (shown in black) is replaced by magnet rods (also shown in black). The magnet rods are arranged as a separate unit in the immediate vicinity of the film diaphragm. The frame supports the film diaphragm and the magnet rods.

When the coil on the film diaphragm is excited by the signal of the Top HiFi amplifier, a magnetic field is generated which moves back and forth in relation to the magnet rods. A different sound level is generated depending on the intensity of the movement.



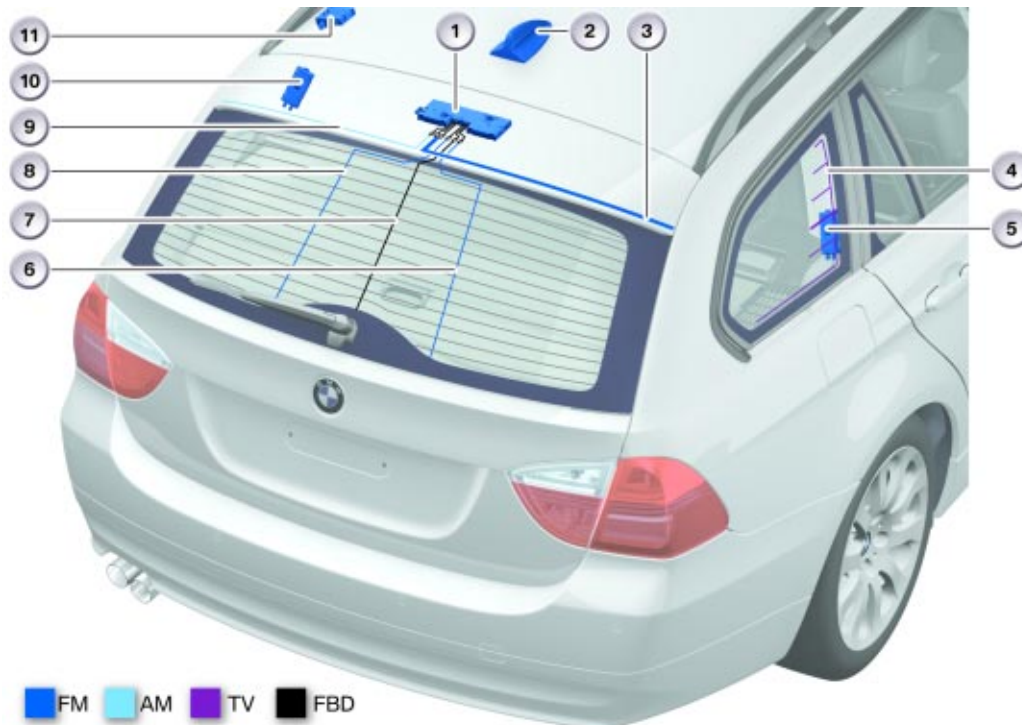
Conventional and Electro-Dynamic Planar Speaker Designs

Aerials / Antennas

The E91 has several antenna systems, depending on the optional extras:

- FM/AM radio (rear window and rear spoiler)
- Digital radio (roof-mounted antenna)
- Navigation (roof-mounted antenna)
- Telephone (roof-mounted antenna)
- Bluetooth antenna in steering column casing for mobile phone connection
- Emergency antenna on rear left wheel arch (only in conjunction with BMW ASSIST)
- Remote control services

A HMBL filter is fitted in order to suppress disturbing pulses during radio reception caused by the high-mounted brake light (HMBL). The blocking circuits for the rear window supply lead (+/-) are integrated in the HMBL filter.



Antenna Locations

Index	Explanation	Index	Explanation
1	Diversity Module	7	FBD Antenna
2	Roof Antenna (GPS, SDARS, NAV, TEL)	8	FM2 Antenna
3	FM1 Antenna	9	AM Antenna
4, 5, 10	TV Antennas	11	High Mounted Brake Lamp (HMBL) Filter
6	FM3 Antenna		

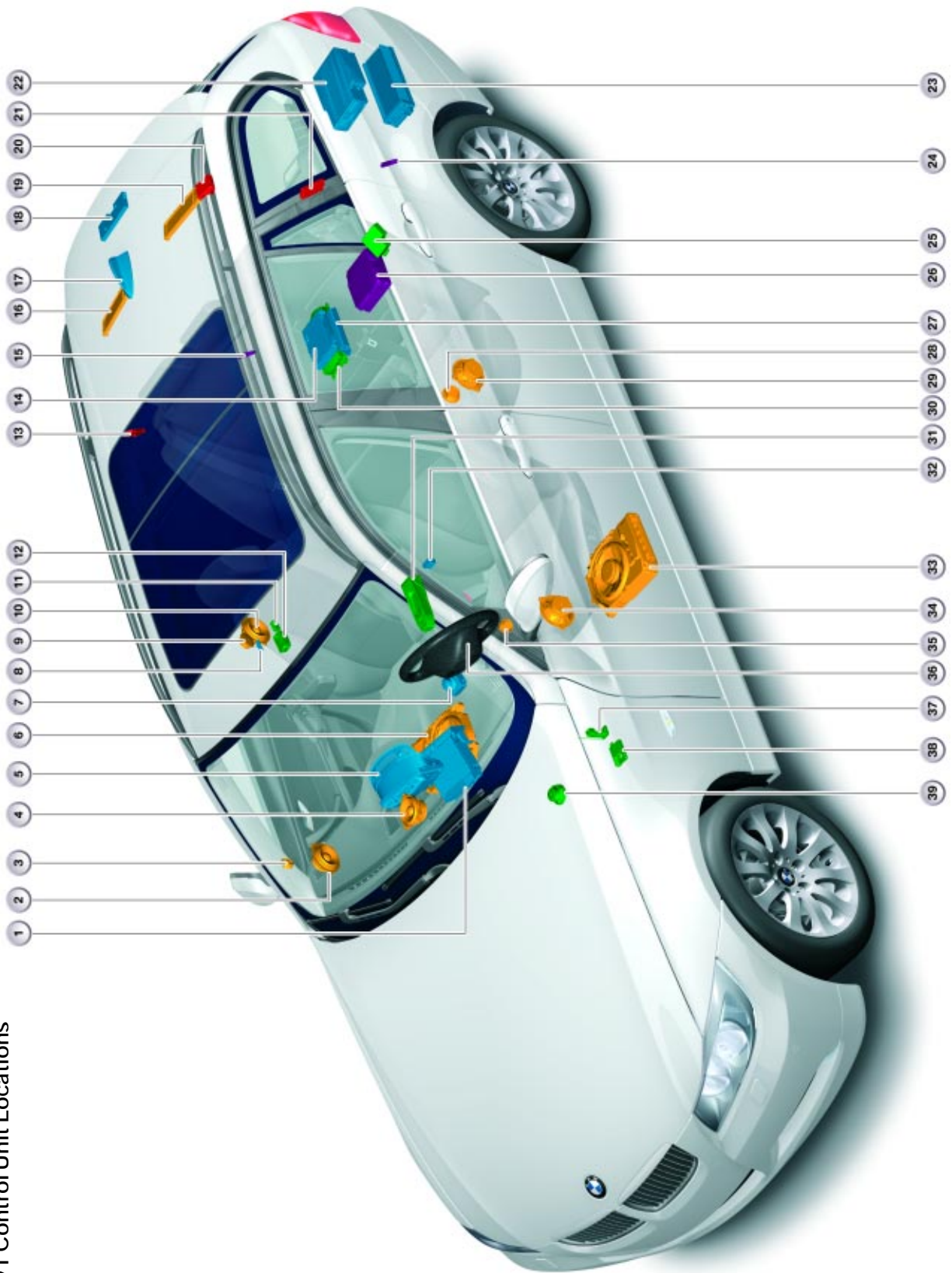
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E91 Control Unit Locations

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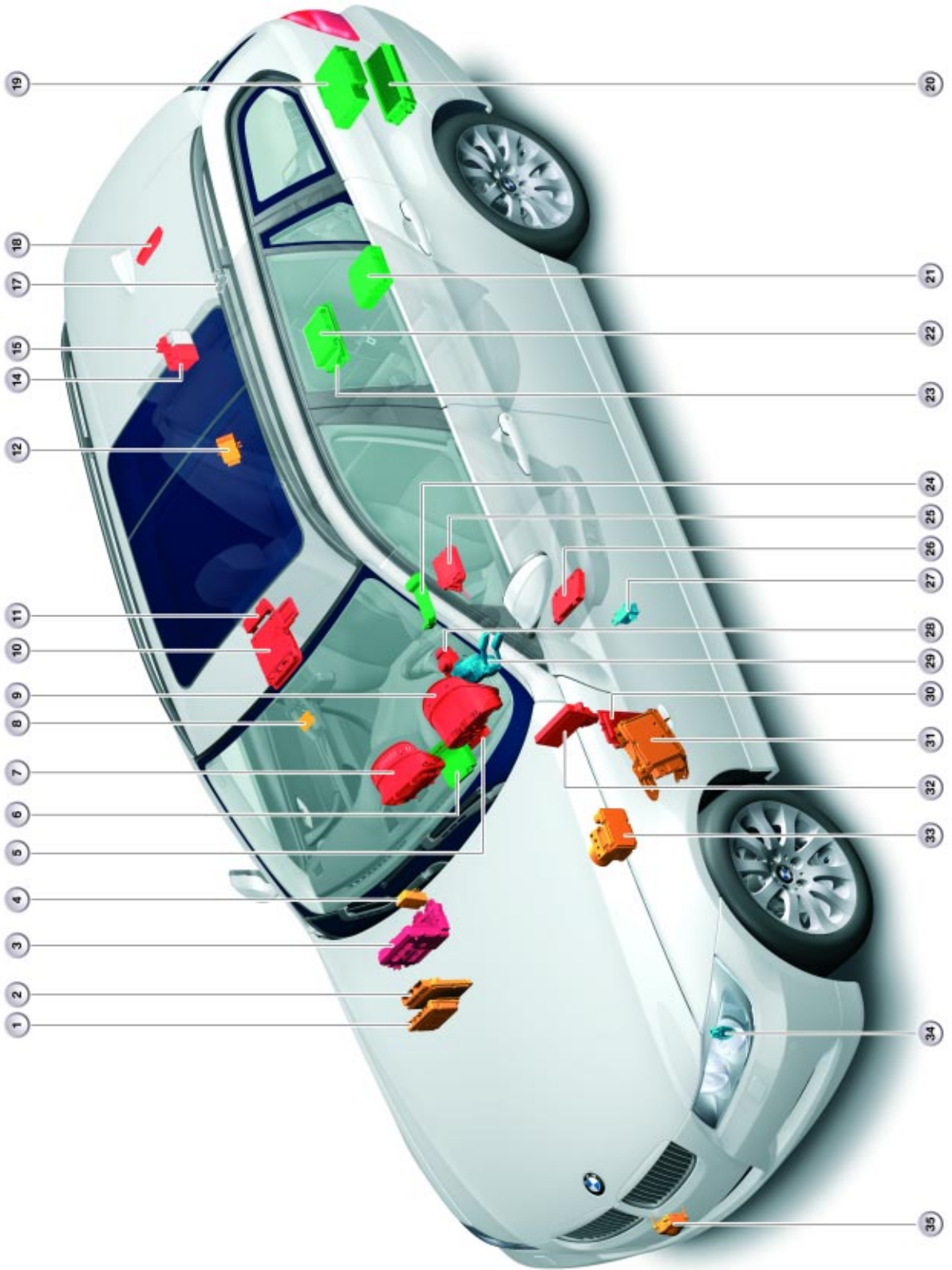
E91 Sports Wagon



Legend for E91 Control Unit Locations

Index	Explanation	Index	Explanation
1	Rad2 or CCC	22	CD Changer
2	Mid-range Speaker, Front Right	23	Audio Amplifier
3	Tweeter, Front Right	24	Wheel Speed Sensor, Rear Left
4	Mid-range Speaker, Front Middle	25	Emergency Antenna (only with TCU)
5	Central Information Display (CID)	26	IBOC Tuner (3/2006)
6	Central Woofer (Right)	27	not for US
7	Controller	28	Tweeter, Rear Left
8	Microphone, Passenger's Side	29	Mid-range Speaker, Door, Rear Left
9	Tweeter, Rear Right	30	ULF Kit
10	Mid-range Speaker, Rear Right	31	Telephone with Snap in Adapter
11	Microphone, Driver's Side (Telephone)	32	Auxiliary Audio Input
12	Emergency Call Button (only with TCU)	33	Central Woofer, Left
14	Satellite Radio SDARS	34	Mid-range Speaker, Front Left
15	Wheel Speed Sensor, Rear Right	35	Tweeter, Front Left
17	Roof Mounted Antenna (SDARS/TEL/GPS/RAD)	36	MFL
18	Antenna Amplifier with Diversity Unit	37	MOST Direct Access Port
19	Electro-Dynamic Planar Speaker, Left	38	Bluetooth Antenna
20	Suppressor Filter for Auxiliary Brake Light and Rear Window	39	Emergency Speaker (only with TCU)

E91 IKT Control Unit Locations



Legend for E91 IKT Control Unit Locations

Index	Explanation	Index	Explanation
1	Electronic Transmission Control Unit	19	CD Changer
2	Digital Motor Electronics Control Unit	20	Top HIFI Amplifier
3	Junction Box Control Unit	21	Video Module (not for US)
4	Longitudinal Dynamics Management Control Unit	22	Satellite Radio SDARS
5	IHKA Control Unit	23	Telematics Control Unit
6	Rad2 or CCC	24	Universal Charging and Hands-free Kit
7	Central Information Display	25	Multiple Restraint System 5
8	Rain Light Sensor	26	Seat Module, Driver
9	Instrument Cluster	27	DSC Sensor
10	Roof Function Center	28	Controller
11	Ultrasonic Interior Sensor	29	Steering Column Switch Cluster
12	Electronic Fuel Pump Control Unit	30	Footwell Module
13	Trailer Module (not for US)	31	Active Front Steering
14	Park Distance Control	32	Car Access System 2
15	Comfort Access	33	Dynamic Stability Control
16	Control Unit Trailer Toe Hitch (not for US)	34	Steering Angle Sensor
17	Intelligent Battery Sensor	35	Active Cruise Control
18	Multi Drive Sunroof Control Unit		